INTERIM REPORT

NONCONNAH CREEK
TENNESSEE AND MISSISSIPPI

JOINTLY PREPARED BY

DEPARTMENT OF THE ARMY
MEMPHIS DISTRICT, CORPS OF ENGINEERS
MEMPHIS, TENNESSEE

DEPARTMENT OF AGRICULTURE
NASHVILLE, TENNESSEE

OCTOBER 1973

Interim Report
on
Nonconnah Creek, Tennessee and Mississippi

Prepared Jointly By

Department of the Army
Memphis District, Corps of Engineers
668 Clifford Davis Federal Building
Memphis, Tennessee 38103

U.S. Department of Agriculture
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Nashville, Tennessee 37203

In Cooperation With The Following
Local Sponsoring Agencies:

The Chickasaw Basin Authority, Tennessee
Shelby County Soil Conservation District, Tennessee
Desoto County Soil and Water Conservation District, Mississippi
Marshall County Soil and Water Conservation District, Mississippi

- [illegible]
- [illegible]
Basin 40% urban [illegible] in several years
- [illegible] from [illegible]
[illegible]
- [illegible]
[illegible]

SYLLABUS

This review report was prepared jointly by the Soil Conservation Service under direction of the Secretary of Agriculture and the Corps of Engineers under direction of the Secretary of the Army, as requested by resolution adopted 29 September 1972 by the Committee on Public Works of the United States Senate. Studies made in preparation of this report indicate that a program of improvement involving project features of both the Corps of Engineers and Department of Agriculture is needed and warranted in the Nonconnah Creek Basin.

The primary problem along Nonconnah Creek is the imminent threat of major flood damage to the rapidly-urbanizing area within the city limits of Memphis, and the floodplain lands in transition from farm land to urban in Shelby County, Tennessee. It is estimated that the monetary damage from the 100-year flood if it occurred today (1973) would be in excess of 13 million dollars.

Urbanization is expected to continue at an increasing rate, and if a program of development and control of water and related land resources is not implemented, potential flood damages will increase, and existing environmental values will be destroyed by urbanization.

The recommended plan contains the essential features of a program of development to meet needs for flood control, watershed protection, economic growth, outdoor recreation, open space, and environmental needs of the basin. It is sensitive to regional and national concern for preservation and enhancement of natural environmental values while including local needs for flood control in a rapidly urbanizing area. Sponsors have agreed that the recommended plan meets local objectives. The plan as recommended is the most desirable plan of development. It consists of a comprehensive watershed program to be implemented jointly by the Corps of Engineers, the United States Department of Agriculture, and the local sponsoring organizations. The USDA will have responsibility for three floodwater control structures on the Johns Creek tributary and a basinwide program of land treatment for erosion and sediment control on 35,010 acres. The Corps of Engineers will have responsibility for: construction of multi-purpose flood control and recreation lake; 7 miles of channel clean out; 12 miles of channel enlargement; development of recreation, preservation and enhancement of natural environmental values within a 600-foot wide greenway-floodway extending 20 miles from the mouth of Nonconnah Creek to the flood control structure.

The total estimated cost of land treatment to be accomplished with assistance of the Department of Agriculture is $2,390,000 of which $1,370,500 would be Federal; total estimated cost of all work to be performed with assistance of the Department of Agriculture is $9,879,000 of which $8,356,500 would be Federal. The estimated cost of three control structures to be installed by the Soil Conservation Service is $7,489,000 of which $6,986,000 would be Federal. Total estimated cost of all work to be performed by the Corps of Engineers is $56,449,000 of which $41,515,000 would be Federal. Total estimated annual charges for structural work are $4,406,700, and total expected benefits are $6,637,600; and the ratio of expected average benefits to estimated annual charges is 1.5.

The District Engineer and State Conservationist recommend modification of existing projects and authorization of the proposed plan to provide for improvement in the Nonconnah Creek basin. Local cooperation requirement for project features recommended for construction are generally in accordance with Section 3 of the Flood Control Act approved 22 June 1936, as amended.

CHICKASAW BASIN AUTHORITY
ROOM 741 • 160 NORTH MAIN STREET
SHELBY COUNTY ADMINISTRATION BUILDING
MEMPHIS, TENNESSEE 38103

September 14, 1973

Colonel A. C. Lehman, District Engineer
Corps of Engineers
Federal Building
Memphis, Tennessee

Mr. Paul Howard
Tennessee Conservationist
Federal Building
Nashville, Tennessee

Gentlemen:

The alternative plans for erosion control, flood control, recreation, and other improvements in the Nonconnah Basin as jointly developed by the Corps of Engineers and the Soil Conservation Service have been reviewed by the Chickasaw Basin Authority. The plan as recommended by the Corps and Soil Conservation Service, to include flood control storage on the Main Channel of Nonconnah Creek and the Johns Creek Tributary is considered to be the most desirable plan for flood control and has been adopted by the Chickasaw Basin Authority.

It is our intention to fully develop and utilize the recreation opportunity of the proposed Nonconnah Lake.

The Chickasaw Basin Authority is fully empowered under state law to serve as local sponsors and meet local cost requirements for Federal water resource development projects in the Nonconnah Basin. The Basin Authority will provide local contribution and other assurances as normally required for construction and operation of the recommended flood control works, and recreation developments to include the recommended recreation storage, the North Park and South Park on the Nonconnah Lake and the greenway development, depending on availability of funds and authorization of the project at the Federal level.

Colonel A. C. Lehman
Mr. Paul Howard

As you are aware, local and state governments have made more than $11,000,000.00 available to the Authority for advance purchase of lands which will be needed for this project. Lands are currently being purchased for the proposed Nonconnah Reservoir and North Park. It is anticipated that the cost of lands for the flood control reservoir on the Main Channel of Nonconnah Creek will be assumed by the Corps of Engineers in accordance with established Federal policy. If the funds which have been invested in reservoir lands are returned to the Authority after the project is authorized and funded by the Congress, the funds will be available to meet local cost requirements in other projects features.

It is requested that authorization of the project be gained as soon as possible to avoid unnecessary delays in proceeding with these vitally needed flood protection measures.

Very truly yours,

Robert B. James

Robert B. James, Chairman
Chickasaw Basin Authority

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SECTION I - AUTHORITY AND SCOPE

1. AUTHORITY

This interim report is submitted in partial response to the following resolution, adopted 29 September 1972 at the request of Senator Howard Baker of Tennessee.

"RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE UNITED STATES SENATE, that the Secretary of the Army and the Secretary of Agriculture, are hereby authorized and directed to make joint investigations and surveys, coordinated with other Federal Agencies, of the Wolf and Loosahatchie Rivers and Nonconnah Creek in Shelby, Fayette, Tipton and Hardeman Counties, Tennessee and DeSoto, Marshall, Tippah and Benton Counties, Mississippi, to determine the advisability of constructing a project consisting of major reservoirs and channel improvements on the Wolf and Loosahatchie Rivers and the Nonconnah Creek and for upstream watershed improvements, all in the interests of flood prevention and control, water disposal, water quality control, water supply, recreation, fish and wildlife, environmental quality, watershed protection and allied purposes, with particular reference to the immediate development and submission of an interim report on measures to eliminate critical floodwater and sediment problems on Nonconnah Creek and to provide needed water-based recreational opportunities and watershed protection within this basin. The report to be prepared and submitted in compliance with the provisions of PL 639, Eighty-seventh Congress."

This interim report is also responsive to the following resolution, adopted 28 October 1970 at the request of Senator Howard H. Baker, Jr., and former Senator Albert Gore, both of Tennessee:

"RESOLVED BY THE COMMITTEE ON PUBLIC WORKS OF THE UNITED STATES SENATE, That the Chief of Engineers, United States Army, be, and is hereby requested to review the report on the Mississippi River and Tributaries Project, published as House Document Numbered 308, Eighty-eighth Congress, and other pertinent reports, with a view to determining whether any modification of the recommendations contained therein, are advisable at this time, with particular reference to the Nonconnah Creek Basin, Tennessee and Mississippi."

2. HISTORY OF NONCONNAH CREEK GENERAL INVESTIGATION STUDIES

By the early 1950's, extensive urbanization began to develop in the Nonconnah Creek floodplain. There had been several previous floods, but little was actually known at that time of the frequency or extent of flooding which could be expected.

In the mid 1950's, the City of Memphis and Shelby County had an engineering study made by a private consulting firm to develop a flood control plan for the Nonconnah Creek and its major tributaries. In a report dated 1956, this engineering firm recommended that 21.6 miles of Nonconnah Creek, and all tributary channels be lined with reinforced concrete to withstand expected velocities capable of eroding earthen channels, and protect adjacent areas from the 25 year frequency flood. However, no action was taken because of estimated project costs and limited funds.

Two years later, in 1958, extensive damage occurred, when almost 5 inches of rain fell over a part of the Nonconnah Basin in less than 8 hours. As a result of the 1958 flood, and increasing development in the floodplains, citizens and newspaper editorials demanded that local governments find a way to control flooding. The Shelby County Conservation Board responded by requesting the U.S. Department of Agriculture to make a survey to determine if a flood control project was physically and economically feasible. A preliminary investigation completed in 1968 indicated that a feasible project could be developed. In March 1969, Shelby County, the City of Memphis, and the State of Tennessee made application to the Soil Conservation Service for planning assistance under Public Law 566. In order to have priority over other SCS studies in the State of Tennessee, and to accelerate study completion, the County, City, and State government appropriated a total of $95,000 to finance the Department of Agriculture studies.

During the next several months the SCS, in cooperation with other Department of Agriculture agencies, conducted detailed investigations and determined that the most effective means of flood control in the Nonconnah Basin would consist of a system of flood control storage structures on the main channel of Nonconnah Creek and the Johns Creek Tributary, with channel enlargement as necessary on the main channel of Nonconnah Creek below the Johns Creek Tributary. The plan which appeared most favorable included a large structure on the main channel of Nonconnah Creek known as site 3, a smaller structure upstream known as site 13, three small structures on the Johns Creek Tributary, and channel improvement below Johns Creek. The SCS investigation also pointed out the opportunity for development of needed recreation facilities at the site of the large structure.

Because of the large estimated federal cost and the fact that the project was to protect a large urban area, the SCS recommended to local sponsors in May 1970 that the Corps of Engineers be asked to participate in further studies and development of the project. At the requests of local interests, the Senate Public Works Committee adopted a resolution on 28 October 1970 authorizing studies by the Corps of Engineers in the Nonconnah Basin.

In January 1971, local interests requested that the state consider installation of a State Park on the large flood control reservoir proposed on the main channel of Nonconnah Creek. The Governor approved the planning for a State Park on 27 January 1971, and the 1971 Legislature authorized the park and appropriated $750,000 to initiate land purchase in FY 1972. None of the appropriated funds have been spent to date.

The 1971 Legislature also established the Chickasaw Basin Authority, an inter-governmental agency authorized to formulate plans and carry out water resource development projects in the Wolf, Loosahatchie, and Nonconnah Creek Basins of West Tennessee. The authority consists of representatives of County, City, and State governments, empowered to operate within Shelby, Fayette, Tipton, and Hardeman Counties, and serve as local sponsor for Federally approved water resource development projects.

Corps of Engineers investigations were initiated with a public meeting in April 1971. During the next several months the Corps of Engineers and the Department of Agriculture coordinated study efforts to develop the best overall plan of improvement for the Nonconnah Basin. The coordinated studies indicated a need for project features to be developed by each of the two agencies. The studies also indicated that flood control storage on the main channel of Nonconnah Creek can be more economically provided by enlarging the flood storage capacity of the reservoir at site 3, eliminating the need for the upstream reservoir known as site 13.

In September 1971 the Tennessee Department of Conservation completed a preliminary plan for the State Park as authorized by the State Legislature. The plan was presented at several public meetings by the State Conservation Department.

In January 1972, after a review of the coordinated studies of the Corps of Engineers and Department of Agriculture, the Chickasaw Basin Authority asked the Corps of Engineers to prepare a report to recommend construction of the large structure on Nonconnah Creek, necessary channel improvement, and greenway development. They asked the Department of Agriculture to prepare a compatible report to recommend three structures on Johns Creek and an extensive land treatment program for erosion control.

Soon after it was organized, the Chickasaw Basin Authority began purchase of lands for the Nonconnah Lake using funds provided by Shelby County and the City of Memphis. More than $1.2 million were expended for land purchase by August 1972.

In February 1972, the City of Memphis and Shelby County approved an additional $2.5 million each, and the State Legislature approved $5 Million for use of the Chickasaw Basin Authority. The Authority anticipated use of these funds to continue advance purchase of project lands. While considering a land condemnation action in August 1972, the Shelby County Circuit Court declared the Chickasaw Basin Authority unconstitutional because of certain wording in the authorizing act.

Local interests petitioned Senator Howard Baker on 11 September 1972, and Senator Baker requested a resolution of the Senate Public Works Committee directing preparation of a joint report by the Secretary of the Army and the Secretary of Agriculture. The resolution was adopted 29 September 1972.

On 28 September 1972, the Tennessee Conservation Department requested that the plan for the State Park as prepared by the Conservation Department and authorized by the State Legislature be included in the Corps investigation, and recommended for construction with the assistance of the Corps of Engineers. The Governor made a similar request in a meeting with the Memphis District Engineer and State Conservationist on 22 November 1972. It was pointed out at this time, however, that there was some concern among the state planners as to whether the State Park should be developed at the Nonconnah Site.

Subsequent to adoption of the resolution of the Senate Public Works Committee in September 1972, representatives of the Soil Conservation Service and the Corps of Engineers worked together in preparation of a joint report outlining the coordinated studies of the two agencies, and jointly recommending authorization of the joint plan of improvement. A draft report was completed and distributed for review on 18 April 1973.

In May 1973, the Tennessee State Legislature re-enacted the authorization of the Chickasaw Basin Authority, correcting the wording found unconstitutional in the original bill. The bill passed after considerable debate, with one member of the local congressional delegation opposed.

In a letter dated 6 July 1973, and in a meeting with the Memphis District Engineer and SCS State Conservationist on 30 July 1973, Governor Dunn stated that he had decided that the state should not participate directly in the proposed park development at the Nonconnah reservoir site.

The Governor stated that he was not opposed to construction of a lake on Nonconnah Creek if it is determined to be the best means of flood control by the Chickasaw Basin Authority, the Corps of Engineers, and Soil Conservation Service.

The Governor and representatives of his staff have stated that limited funds for State Park development may be better utilized to develop facilities at other locations. They also stated that non-federal costs of recreation facilities in the Nonconnah project should be financed by local governments. However, such state funds as may be appropriated for use of the Chickasaw Basin Authority will be available to meet local cost sharing responsibilities for all features of the Nonconnah project.

In a letter dated 14 September 1973 to the Memphis District Engineer Corps of Engineers, and SCS State Conservationist, U.S. Department of Agriculture, the Chickasaw Basin Authority requested early authorization of the project as recommended in this report. They also stated a willingness and intent to provide local contribution and other assurances as required for the flood control and recreation project, including the North and South Parks on the proposed Nonconnah Lake.

3. EXTENT OF INVESTIGATION

a. Descriptive Summary of Studies. This report presents the results of a general investigation of the water and related land resources of the Nonconnah Creek Basin, Tennessee and Mississippi. The studies were conducted as a joint effort of the Corps of Engineers, the Department of Agriculture, the Chickasaw Basin Authority, and other Federal, State, and local agencies. During the studies, consideration was given to need for a program to provide for flood control (both structural and nonstructural), watershed protection, recreation, open space, protection and enhancement of fish and wildlife resources, erosion, sediment, and pollution control to provide a high quality environment. Assessment of economic, social, and environmental effects of proposed plans were made in accordance with directives of Congress contained in Section 122 of the River and Harbor and Flood Control Act of 1970, Public Law 91-611.

b. Scope of Investigation. Aerial photographs, topographic information, and existing survey data were supplemented by additional field surveys, and foundation investigation as necessary to determine the feasibility of projects to meet water resource development needs in the Nonconnah Basin. Office studies consisted of hydrologic, hydraulic, and economic analyses; designs; and estimates of quantities and cost of major items of construction, relocations, and real estate required for the project.

c. Field Reconnaissance. Field reconnaissances of the basin were made to determine needs; to select location and estimate costs of project

features; to determine effects of project features on fish, wildlife, and other environmental resources; and to determine economic impacts of the various plans considered.

d. Environmental Inventory. During the investigation a complete environmental assessment of the Nonconnah Basin was made to determine the location and extent of environmental resources which should be considered in project development. The assessment was made by the Institute of Engineering Research, Memphis State University, Memphis, Tennessee. Copies are on file in the Memphis District Office, Corps of Engineers.

SECTION II - PRIOR REPORTS

4. PRIOR REPORTS CONSIDERED BY CONGRESS

The following prior reports have been submitted to Congress by the Corps of Engineers in consideration of improvements by the Corps of Engineers in the Nonconnah Basin.

a. Report in 1937. The Flood Control Act of 28 August 1937 authorized flood control improvements in the lower 3 miles of Nonconnah Creek as a part of the project to protect areas of Memphis, Tennessee from floodwater of the Mississippi River. No records of a published report by the Secretary of the Army preceding the authorization have been located.

b. House Document 308, 88th Congress, 2d Session. This document contains a report dated 22 October 1959 of investigations conducted to determine the feasibility of providing flood control improvements in basins tributary to the Mississippi River. The report was prepared in response to a resolution of the Senate Public Works Committee adopted 12 June 1954. No improvements were recommended in the Nonconnah Basin.

oth. USDA Reports

Chickasaw

Hatchie River Dam 7 yr IV report

SECTION III - DESCRIPTION

5. LOCATION

The Nonconnah Creek Basin includes portions of Shelby and Fayette Counties in southwest Tennessee, and extends into DeSoto and Marshall Counties in northwest Mississippi. Nonconnah Creek is tributary to the Mississippi River. Approximately one-half of the city of Memphis, Tennessee is located in the Nonconnah Basin. The location and extent of Nonconnah Basin are shown on Plate 1.

6. TOPOGRAPHY

The Nonconnah Basin is approximately 32 miles long, generally rectangular in shape, and has a maximum width of approximately 10 miles. Total drainage area of the basin is 117,200 acres or 183.1 square miles. Topography varies from gently rolling hills and ridges in upland areas to moderately wide valleys. Elevations range from 215 feet above mean sea level in lower floodplain areas to 390 feet mean sea level in hill areas.

7. GEOLOGY

Nonconnah Basin lies within the Gulf Coastal Plain physiographic area. This plain has been dissected to a variable degree. The valleys in this basin are well incised. Tributary streams have moderately wide valley floors. The hilltops and ridgetops are rounded with moderately sloping valley walls. Uplands are considered rolling to undulating. The watershed has a dendritic drainage pattern. Exposed on or near the surface in this watershed are sedimentary and windblown geologic formations ranging in age from Upper Eocene to Recent. The following geologic column represents the sequences of these formations:

SYSTEM	SERIES	SUBDIVISION
Quaternary	Recent	Alluvium
	Pleistocene	Loess
Tertiary	Pliocene	Terrace Gravel
	Upper Eocene	Jackson Formation
	Upper Eocene	Grenada Formation

A description of the above subdivisions is as follows:

a. <u>Alluvium</u> is found in the floodplains of all drainages. The alluvium is comprised primarily of silt derived from the upland loess. This alluvium is up to 30 feet thick and a large portion has been deposited in modern times. Several tributaries on the southwest section of the watershed have large scale gravel and sand quarries. These areas are contributing coarse grain deposits to the floodplain.

b. Loess is an aeolian (wind-lain) silt or clayey silt which mantles the entire watershed outside of the floodplain. Total thickness of the loess decreases from about 100 feet along the western edge to less than 10 feet in the eastern edge of the watershed. The loess is unconsolidated and is weathered to a considerable depth. When unweathered, it is calcareous and gray in color. Weathered loess is generally buff colored. Texture varies only slightly from the surface to the base of the deposit.

c. Terrace Gravel underlies the loess deposit except where removed by erosion before the loess deposition. This deposit was laid down as alluvium and is comprised of well-rounded chert gravel and cobbles with a matrix of clayey sand or sandy clay. It is unconsolidated. Maximum thickness is about 60 feet but this is variable.

d. Jackson Formation consists of fine sand, silty sand, clayey sand and gray clay. These materials probably vary from unconsolidated to semi-consolidated. Lignite and organic matter are common. This formation is at least 100 feet thick but it is exposed only in the bottom of some of the deeper channels in the western edge of the Basin. The Jackson formation underlies the floodplain alluvium, the terrace gravels and the loess where the gravels are absent. The dip is about 15 feet/mile to the west.

e. Grenada Formation is the uppermost formation of Eocene age which comprises the Wilcox group. This formation consists primarily of sand with clay lenses and thin deposits of lignite.

8. SOILS

Upland soils are of the Grenada-Loring-Memphis Association. This association is predominantly undulating to rolling. It consists of broad ridges that are gently sloping with strongly sloping side slopes, and many small drainageways. The soils of this association formed in silt deposits ranging from 5 to more than 20 feet thick. They range from well drained to poorly drained. Grenada soils, which are moderately well drained, predominate. They have a brown silty surface layer and a yellowish-brown silt loam subsoil. A compact (fragipan) layer begins 16 to 28 inches below the surface, which causes water to drain slowly through the subsoil and influences the use suitability and management requirements for crops. The Grenada soils are commonly on nearly-level wide ridgetops and sloping hillsides. The nearly well-drained Loring soils have a brown, silty surface layer and a dark brown, silt loam subsoil with a compact (fragipan) layer starting at about 28 inches below the surface. The Loring soils are on the sloping ridgetops and hillsides. Memphis soils, which are well drained, have a brown, silty surface layer. The subsoil is dark brown, silty clay loam. Memphis soils are on the broader ridgetops and steeper hillsides. Collins and Falaya soils are in the adjacent narrow bottoms.

Silty soils of recent alluvium are found on the floodplains. These are the Falaya-Waverly-Collins Association. These soils occupy the alluvial plain of Nonconnah Creek. All of these soils are susceptible to flooding. The soils are silty and fertile. They differ in natural drainage. The Collins soils, which occupy about 15 percent of the association, are best drained of the three, although not well drained. Ranking next are the Falaya soils, which occupy about 65 percent of this association. The Waverly soils, which occupy about 20 percent of the association, are the wettest. They are capable of growing corn and soybeans if moderate artificial drainage is provided.

9. STREAM AND DRAINAGE AREA CHARACTERISTICS

Nonconnah Creek has a dendritic drainage pattern and is relatively straight from the mouth to a point about 20 miles upstream. The stream gradient is approximately 5 feet per mile. The existing channel section varies from a 90-foot bottom width and a 20-foot depth near the mouth, to 30 feet by 20 feet at mile 12, and 20 feet by 20 feet at mile 22. Major tributaries are Johns Creek (drainage area 27.2 square miles), Collierville Creek (drainage area 10.6 square miles) and Days Creek (drainage area 10.1 square miles). There are numerous smaller tributaries of less than 10 square miles drainage area.

The 117,200-acre drainage area is approximately 40 percent urban. Over the next several years, urbanization will continue and the entire basin may be expected to urbanize. As the area is urbanized, the percentage of open land, and the amount of rainfall infiltration will be significantly decreased. This will result in increased run-off. Flood flows in major tributaries will also be increased by storm drains and paved collection channels in residential areas, and reduced time of concentrating runoff into the main channels.

10. ENVIRONMENTAL SETTING

Intermittent stream flow, pollution in the urban area, and heavy sedimentation from urban and industrial development together with farm practices provide restrictions on the variety of aquatic plants and animals. Terrestrial species are similarly limited by the extent and quality of forest habitat. Approximately 6,000 acres of the watershed (less than 5 percent) is in forest cover. This cover consists of small, scattered patches of woodland in poor condition. Composition is about 40 percent oak-hickory, 25 percent gum-cypress, and 35 percent elm-ash-cottonwood. Nearly all woodland is privately owned, with only about 300 acres found on institutional, industrial, or municipal lands such as park and cemetery lands. No state or national forest lands are located in the watershed. A detailed list of native upland flora and

aquatic macrophytes of the basin has recently been compiled and is on file in the Memphis District Office. Over three-fourths of the forested land is less than 40 percent stocked with desirable species. Higher plant aquatic vegetation is adequate, in the upstream areas, to maintain a balanced ecosystem. Within the lower urbanized reaches, the producers (green plants) in the creek are restricted which in turn limits consumers (vertebrate and invertebrate animals). Birds are representative of the region, with the exception of aquatic and water dependent species which are rare because of the intermittent flow of the stream, lack of permanent pools, lack of cover, scarcity of food, and degree of urbanization. Fish, amphibians, and some turtles comprise the aquatic vertebrate fauna of Nonconnah Creek and its tributaries. The fish population is very limited, comprising about a dozen species. Carp is common in the lower reaches of the creek. The green sunfish is common upstream. The bluegill sunfish, though not reported, should be present also. The most frequently found fish are top minnows, gambusia, and red fin shiners along with sunfish and carp. Terrestrial invertebrate fauna of the basin are typical of an urbanized area. Insects predominate as they do the world over. Flies and mosquitos are abundant. Aquatic invertebrates are relatively scarce in the stream, and provide limited or no value in the food web in the lower reaches of the creek.

Public awareness of environmental quality problems and enforcement of pollution control standards will result in increased quality of water and air over the next several years. However, expanding urbanization will virtually eliminate wildlife habitat, except in restrictive park areas.

11. AREA MAPS

The area included in this study is shown on the Memphis, Bartlett, Collierville, Horn Lake, Hernando, and Byhalia quadrangle sheets of the Corps of Engineers (1:62,500), and portions of the area are shown on the Southwest Memphis, Southeast Memphis, Germantown, Southwest Collierville, and Rossville quadrangle sheets of the U.S. Geological Survey (1:24,000).

SECTION IV - ECONOMIC DEVELOPMENT

12. GENERAL

The Nonconnah Basin contains approximately one-half of the area of the city of Memphis, Tennessee. Memphis is the primary trade center for the mid-south and as such serves as the center for manufacturing, distribution, education, transportation, medical services, finance and communication. Outside the urbanized area, lands are used for agricultural production and suburban residential areas. Primary agricultural uses include production of soybeans and cotton, plant nurseries, and pastureland.

13. POPULATION

In 1970, Memphis and Shelby County had populations of 623,530 and 722,014, respectively. The basin population also includes some people in DeSoto and Marshall Counties, Mississippi. It is estimated that the Nonconnah Watershed had a population of 280,000 in 1965, projections indicate that the population will be 528,000 in 1990. Since 1900, Shelby County has had an average growth rate of 30.8 percent per decade as compared to an average national rate of 13.5 percent.

14. OCCUPATION AND INDUSTRIES

Most of the people in the Nonconnah Basin are employed in the manufacturing, trade, transportation, or services industries associated with the Memphis urban area. There are many industrial parks composed of light industry, warehousing, and office complexes throughout the basin. There are also several large industries representing major corporations in the Nonconnah Basin. There are approximately 370 farms in the outer basin areas. The average medium family income ranged from a low of $4,205 to a high of $22,736 per census tract in 1970. Per capita income is expected to increase by more than 60 percent by 1990.

15. LAND USE AND DEVELOPMENT

The Nonconnah Basin is being rapidly urbanized by industrial, commercial, and residential development. Floodplain lands are being filled and developed, resulting in increased threat of severe flooding on lands previously developed. More than 40 percent of the lands are urbanized. Land values are governed more by potential for urban development than by potential for agricultural use. It is expected that the entire basin will be completely urbanized within the next several years.

The medium density of population in Memphis is 11 to 20 persons per acre.

A certain amount of compaction is underway in the metropolitan area at the present time. Within the last five years, the number of apartment units constructed exceeded the number of single family units. Much of this construction has been in the form of redevelopment, both public and private, in the older close-in neighborhoods in Memphis.

Significant compaction, on the order of raising the average density for the urban area to fifty or more persons per acre, is highly unlikely during the foreseeable future. Relatively light traffic congestion, reasonable travel times, and the availability of outlying land at economical prices will continue to work against any significant reversal of the outward movement of the population and the development of large-scale, in-town concentrations of population density for the foreseeable future.

Plates C-1, C-2, and C-3 of Appendix C show generalized form of historical and expected future land use, and distribution of population density.

16. TRANSPORTATION FACILITIES

The Memphis International Airport is located in the Nonconnah Basin. Interstate Highway 240 bisects the lower half of the basin from east to west, and Interstate 55 crosses from north to south. Other highway crossings include U.S. Highways 78, 61, 51, and 72, and a network of local streets and county roads. The area is served by eight major railroads. The Mississippi River, which flows adjacent to the basin, is a major artery of the inland waterways system of the United States.

In 1964, the City of Memphis; Shelby County, Tennessee; DeSoto County, Mississippi; the Tennessee Department of Highways; and the Mississippi Highway Department in cooperation with the U.S. Bureau of Public Roads inaugurated a continuing comprehensive transportation planning program for the Memphis urban area. This resulted in the Memphis Urban Area Transportation Study (MUATS) as a permanent continuing study. The MUATS committee maintains an updated plan to develop transportation facilities to meet the expanding needs of the Memphis urban area.

Project alternatives considered in this investigation have been coordinated with the MUATS committee.

SECTION V - CLIMATOLOGY AND STREAMFLOW DATA

17. TEMPERATURE

The mean annual temperature is 62 degrees Fahrenheit. January is the coldest month with an average temperature of about 41 degrees, and July is the warmest month with an average of 81 degrees. Recorded extremes are 106 degrees and minus 13 degrees. The average length of the growing season is 237 days, beginning in April and ending in November.

18. RAINFALL

Average annual rainfall is about 50 inches. Normal monthly rainfall varies from an average of 3 inches in October to more than 5 inches in March.

19. RUNOFF CHARACTERISTICS

The predominant cause of flood threats in the Nonconnah Creek Basin is runoff from high-intensity thunderstorm rainfall. Approximately 40 percent of the drainage area is urbanized, and less than 5 percent is covered by forest land. This condition contributes to rapid runoff and flooding from moderate to heavy rainfall. Continued urbanization will increase runoff and threat of flooding.

20. FLOODS OF RECORD

Major floods occurred on 21 November 1934, when 10.48 inches of rain fell over the Memphis area in 24 hours, and on 9 May 1958 after 4.76 inches of rain fell in approximately 8 hours. In 1934, there was little development in the Nonconnah floodplain and damage was not extensive. In 1958 many homes and other property were damaged. Table 1 shows maximum 24 hour rainfall at Memphis for 79 years and the greatest 1, 2, 3, 6, 12, and 24 hour amounts recorded. Flood levels of historical rainfall would be higher under present conditions because of increased runoff due to urbanization in the past several years.

TABLE 1

PRECIPITATION RECORDS

Greatest Recorded Precipitation for Memphis, Tennessee
for Periods of 1,2,3,6,12, and 24 Hours

	HOURS											
	1		2		3		6		12		24	
Period	Inches	Year	Inches	Year	Inches	Year	Inches	Year	Inches	Year	Inches	Year
1940-1950	1.70	1948	2.51	1950	2.75	1949	3.70	1947	4.75	1949	5.26	1949
1890-1971	3.25	1929	4.70	1929	5.00	1929	7.03	1934	9.67	1934	10.48	1934
100-Year Frequency from USWB - TP 40	3.4		4.3		4.7		5.6		6.8		8.0	

Greatest 24-Hour Point Rainfall (Inches)
Recorded at Memphis, Tennessee

Years of Record	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Greatest
79	5.75	4.57	9.39	5.26	4.29	9.67	5.42	4.55	4.66	6.44	10.48	5.40	10.48

*Photo 1 – May 9, 1958 Flood - Getwell Road area.
Note South Park School grounds and electric substation.
Area in background across Nonconnah Creek is presently
developed in subdivisions.*

*Photo 2 – May 9, 1958 Flood - Nonconnah Creek flood plain.
East of Getwell Road.*

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Photo 3 - May 9, 1958 Flood - Corner Watson and Barr Streets

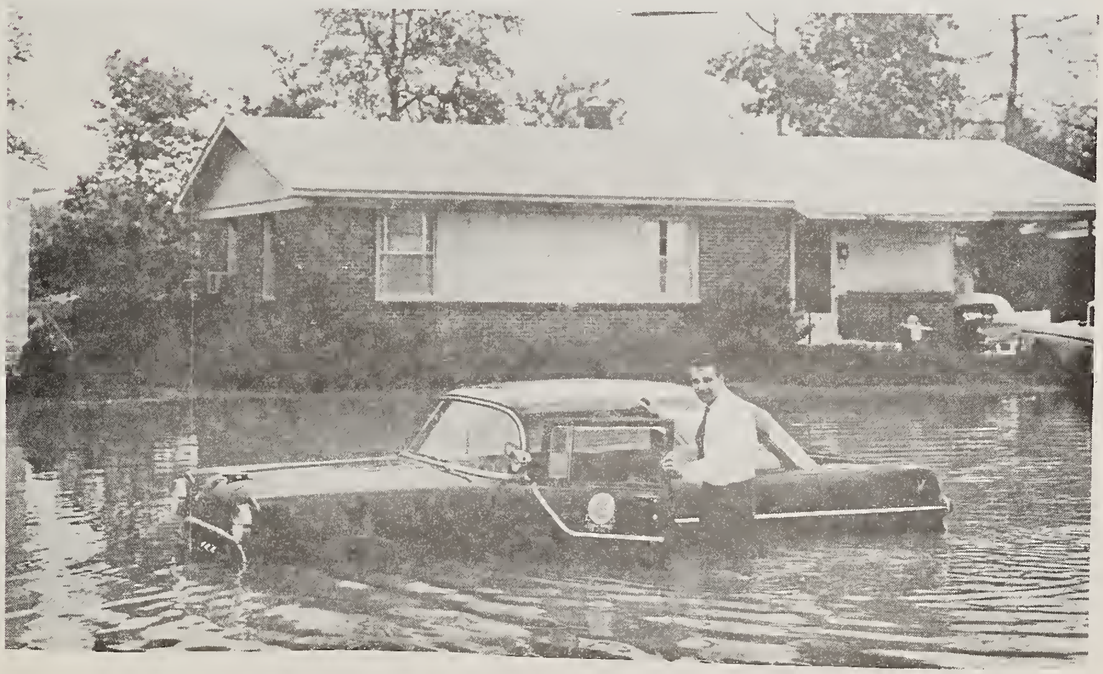

Photo 4 - Henry Loeb, former mayor of Memphis, inspects flooded area during May 9, 1958 flood. (PHOTO COURTESY OF MEMPHIS PRESS-SCIMITAR)

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Photo 5 – May 9, 1958 Flood - Mallory Road between Perkins and Tahiti Roads. Note beginning of Fox Meadows Subdivision in background.

Photo 6 – May 9, 1958 Flood - Mallory Road between Watson and Getwell Roads. Note evacuation of residents by boat.

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SECTION VI - EXTENT AND CHARACTER OF FLOODED AREA

21. CHARACTER OF FLOODED AREA

Approximately 13,000 acres would be inundated by the 100-year flood in the Nonconnah Creek Basin. Within the city of Memphis, the demand for land has resulted in almost complete development of the floodplain. The city has required that lands below established flow lines be filled before construction of permanent improvement, but increasing runoff by continued urbanization and changes in flowline standards have resulted in land fill of various elevations, and many of the older fills are subject to inundation, as well as properties on the outer edges of floodplains which have not been filled. Within Memphis there are only extremely limited areas of woodland, and almost no wildlife. Upstream from Memphis there is less development and there are more wooded areas. The wooded areas are in general immediately adjacent to the stream. The elevation of the 100-year flood, if it should occur today, would be above the first floor elevation of about 3,500 single family and apartment dwelling units, over 110 commercial buildings, and ten churches, and eight schools. It is expected that the basin will continue to urbanize, and by the year 2000, almost all lands within the Shelby County part of the basin will be completely urban. A more complete description of the environmental character of the basin is presented in paragraph 10.

SECTION VII - FLOOD DAMAGES

22. BACKWATER FLOODING FROM MISSISSIPPI RIVER

There are approximately 6,400 acres near the mouth of Nonconnah Creek which are subject to flooding by Mississippi River backwater. The flood threat on these lands has been recognized by potential developers, and there has been little encroachment into the flood area. Damages to existing property in the Nonconnah floodplain from a 100 year frequency flood occurrence on the Mississippi River would be approximately $2,000. Average annual damage in the Nonconnah floodplain is less than $500 per year. With proper land management, these damages should not increase significantly in future years.

23. HEADWATER FLOODING

Approximately 13,000 acres of land are subject to flooding in the Nonconnah Creek and Johns Creek tributary floodplains from rainfall runoff. Major floods would result in extensive damage to residential, commercial, and public facilities, as well as some agricultural areas. In a floodplain which is developing as rapidly as the Nonconnah, flood damage potential is certain to become more severe. As more areas of the floodplain are developed into commercial and residential use and improvements are made to existing developments, property value in constant dollar terms subject to damage increases. As the watershed becomes more urbanized, rate and quantity of runoff from any given storm increases because previous grass and woodland are replaced with more impervious surface area.

Average annual flood damages have been computed for three points in time under different economic and hydraulic conditions: existing (1970-71) conditions, 1980 conditions, and future (2000) conditions. Potential average annual damages are based on a summary of the mathematical probability of all floods up to and including the 200-year flood in any year. Table 2 shows estimated flood damages for the Nonconnah Creek and Johns Creek floodplains. Column 4 shows the present value of average annual damages which can be expected in future years, computed as 1980 damages and future damages discounted at 5-5/8 percent and converted to an average annual equivalent.

TABLE 2
AVERAGE ANNUAL FLOOD DAMAGES
NONCONNAH CREEK AND JOHNS CREEK FLOOD PLAINS

Economic & Hydrologic Condition: Existing (1970-71)	Base Year (1980)	Future (2000)	Base Year Plus Discounted Future Value
$	$	$	$
1,213,600	3,537,000	5,773,600	4,931,300

Price level: 1972

24. SUMMARY OF AVERAGE ANNUAL DAMAGES

In future years damages of major magnitude can be expected in the Nonconnah Creek Basin about every 20 years. Damages will vary from moderate losses to more than $26,000,000 for single flood occurrences. It is possible that a flood of any given magnitude can occur at any time, but based on mathematical probabilities of floods occurring in any given year, average annual damages of $4,931,300 can be expected in the Nonconnah Creek and Johns Creek floodplains prior to the year 2000, increasing to approximately $6,000,000 per year after that time.

These values do not include costs of emergency activities or business and financial losses which are incurred during flood periods. These damages also do not include intangible values such as possible loss of life, inconvenience, or health hazards which may accompany flooding.

SECTION VIII - EXISTING IMPROVEMENTS BY FEDERAL AND NON-FEDERAL AGENCIES

25. EXISTING CORPS OF ENGINEERS PROJECTS

The Flood Control Act of 28 August 1937 authorized a system of levees, floodwalls, and pumping plants to be constructed along the Wolf River, Mississippi River, and Nonconnah Creek to protect low areas of Memphis from Mississippi River backwater, and for the evacuation of interior drainage. As a part of that project, the Corps of Engineers constructed a levee on the lower three miles of the north bank of Nonconnah Creek, with one pumping plant near Highway 61 to provide for interior drainage. This work was completed in 1941. During 1946 and 1950, the Nonconnah channel was straightened from its mouth to U.S. Highway 51 to prevent stream meandering and damage to the levee system.

26. EXISTING NON-FEDERAL IMPROVEMENTS

During the period from 1938 to 1946, Shelby County constructed a pilot channel from Bailey Station Road to U.S. Highway 51, a distance of approximately 19 miles. Following the 1958 flood, segments of the main channel were improved by clearing and snagging. Many of the small tributaries extending into residential and commercial areas have been improved and several miles of small tributaries have been paved by the city of Memphis. These improvements are continuing. In 1962, Shelby County constructed two small floodwater detention structures on the Hurricane Creek and Ten Mile Creek Tributaries, but because of limited size and drainage area control, the structures have little effect on the main channel of Nonconnah.

The city of Memphis has installed concrete paving in many tributaries in the basin to improve flow capacity and to control stream bank erosion. The city has a continuing program to pave all small tributary channels, particularly within residential areas. This serves to reduce flooding in tributary floodplains. In many cases paved channel carry water to main channels more rapidly, and contribute to the need for main stem floodwater controls. Approximately 2,500 feet of the main channel of Johns Creek has been paved.

27. EXISTING WORK BY THE DEPARTMENT OF AGRICULTURE

About 20,676 acres of land in the basin are under land treatment programs for erosion control and soil conservation, with an additional 9,418 acres receiving technical assistance from the Soil Conservation Service under going programs of the Soil Conservation Districts of Shelby and Fayette Counties in Tennessee and DeSoto and Marshall Counties in Mississippi.

A total of 231 landowners are active cooperators in the District programs. One hundred fifty-nine farms in the watershed have soil conservation plans. It is estimated that about 32 percent of the conservation treatment measures have been applied on the land in the past 10 years with District and other agency assistance. The cost of applying these measures to date is estimated to be about $1,343,000.

SECTION IX - PUBLIC CONTACTS AND IMPROVEMENTS REQUESTED

28. PUBLIC MEETINGS

Both the Corps of Engineers and the Soil Conservation Service have provided numerous opportunities for public participation in development of proposed works of improvements. Both agencies were represented at all public meetings.

a. Public Meeting of 9 October 1970. The Soil Conservation Service discussed its findings on the Nonconnah Creek Study to date at a public meeting attended by members of the Memphis City Council, Shelby County Court, and other interested agency representatives. The public was invited to attend the meeting which was announced by newspapers, television and radio.

b. Public Meeting of 18 February 1971. This meeting was held by the Corps of Engineers to hear the views of interested persons concerning the need and desirability of water resource development in the Wolf, Loosahatchie, and Nonconnah Basins.

c. Public Meeting of 15 September 1971. The Shelby County Conservation Board held a public meeting to discuss the Nonconnah Creek Watershed Program and the proposed Nonconnah State Park. The Soil Conservation Service and the Tennessee Department of Conservation participated in the presentations.

d. Public Meeting of 5 November 1971. The Soil Conservation Service presented its findings and a proposed watershed work plan at a meeting held by the Chickasaw Basin Authority and other local sponsors. Notice of the meeting was carried by local newspapers and announced in other media. Numerous questions were asked by public participants, and comments were varied. Some objections were stated by owners of lands involved in reservoirs. There were no objections to the overall features of the plan.

e. Public Meeting of 29 June 1972. This meeting was held by the Corps of Engineers to present to the public the results of studies to date and obtain the views and opinions of project alternatives under consideration. The meeting created a great deal of interest and many questions were asked. Strong support for projects for flood control and recreation were voiced, and there were some objections, primarily by persons whose lands would be taken for public use by project construction.

f. Public Meeting of 16 February 1973. The Chicksaw Basin Authority held this meeting. Presentation of the history of the investigations, the need for programs of improvement, and descriptions of the proposed projects were presented by the Chickasaw Basin Authority, the Corps of Engineers, and the Soil Conservation Service.

g. Public Meeting of 7 May 1973. A joint public meeting was held by the Corps of Engineers and Department of Agriculture to present the results of the joint investigations. A description of the plan to be recommended and a comparative description of alternatives considered at that point in the investigation were presented.

About 300 people attended the meeting and many expressed their views. Most of those who voiced an opinion recognized and supported the need for flood control improvements, but many objected to flood storage structures as the most desirable means of flood control, and objected particularly to proposed recreation development. There were also several who spoke in favor of mutiple purpose flood control and recreation lakes.

As a result of views expressed about reservoir storage at the Public Meeting, the Corps of Engineers, Department of Agriculture, and the Chickasaw Basin Authority made a more detailed analysis of the feasibility of a flood control plan consisting of channel improvement without reservoir storage. It was determined that it would be necessary to line channels with concrete to provide stable channel capacity for design flows without reservoir storage. Project alternatives described in this report reflect the result of analysis following the Public Meeting on 7 May and review of a draft of this report by other Federal, State, and Local Agencies. The recommended plan as described in this report except for minor modifications is the same as presented as the recommended plan at the Public Meeting.

29. PUBLIC PARTICIPATION

During the course of the studies approximately 5,000 brochures describing the studies were mailed by the Corps of Engineers to residents of the Nonconnah floodplain, and many other individuals and organizations known to have an interest in water resources development. The brochures contained a description of project features under consideration, and contained a questionaire inviting views and comments. Less than 150 of the questionairs were returned. Over 100 of these voiced support of all project features described, and less than 10 voiced opposition or thought there was no need for any project development.

30. MEETINGS WITH LOCAL SPONSORS

The Soil Conservation Service and the Corps of Engineers have met with local sponsoring organizations throughout the course of project planning. The Chickasaw Basin Authority was established in 1971 by the Tennessee Legislature to develop plans and implement projects for control and development of water and related land resources in the Wolf and Loosahatchie and Nonconnah Creek Basins. The Authority holds regular meetings each month, open to the public. Both the Soil Conservation Service and the Corps of Engineers have been represented at each meeting to keep the Authority imformed of progress on the study and to obtain views and comments.

Sponsors were also informed by meetings at various times with the Memphis City Council, Shelby County Quarterly Court and the Shelby County Soil Conservation District. Soil Conservation Service personnel in Mississippi kept the Marshall and DeSoto County Soil Conservation Districts informed of survey progress.

31. MEETINGS WITH CIVIC ORGANIZATIONS

Both the Corps of Engineers and the Soil Conservation Service have met with various civic, social, and professional organizations to present programs outlining the need for water resource development and projects being considered to meet these needs. Many ideas and suggestions made as a result of these programs have been incorporated into the proposed plans of development. One of the most active organizations is the Chickasaw Environmental Association, a group of interested individuals organized to promote conservation of environmental values through orderly development of water resources in the Wolf, Loosahatchie, and Nonconnah Creek Basins of West Tennessee.

The project has been discussed at the Memphis Area Chamber of Commerce, Memphis Engineers Club, Memphis Rotary Club, South Memphis Lions Club, Civitan Club, Kiwanis Club, Capleville Community Club, Collierville Rotary Club, Parkway Village Optimist Club, Memphis Agricultural Club, Eastover Garden Club, Memphis Chapter of the Sierra Club, and school and church groups, using slides and visual material.

Several meetings and conferences were held with representatives of the Nonconnah Improvement Association. The Nonconnah Improvement Association is a group of landowners and citizens organized to oppose construction of the proposed Nonconnah Lake.

32. OTHER INFORMATIONAL ACTIVITIES

Memphis State University in cooperation with the Chickasaw Environmental Association presented three series of seminars in 1970, 1971, and 1972 aimed at building awareness of the need for economic, recreational, and environmental improvement in the Chickasaw Basin including Nonconnah Creek.

WMC-TV, Channel 5, Memphis carried a series of five programs dealing with the problems and proposed solutions of the project. WREC-TV, Channel 3, in a 30-minute documentary "Focus on Memphis" presented the Nonconnah project. WMC-TV also presented a one-hour program with the Memphis District Engineer, the Chairman of the Chickasaw Basin Authority, a state representative, and a representative of the Nonconnah Improvement Association in a discussion of the proposed project. The project was thoroughly covered by the Commercial Appeal, the Memphis Press Scimitar, and other Memphis area newspapers throughout the planning process.

33. IMPROVEMENTS DESIRED

a. Flood Control. The people of the Nonconnah Basin have requested that projects for flood protection be considered by all levels of local, state, and federal government. Although there has not been a major damage producing flood in recent years, many people realize that urbanization has substantially increased runoff characteristics and the threat of major flooding. Local and state governmental agencies have requested both the Corps of Engineers and the Soil Conservation Service to consider a system of storage structures, channel improvement as necessary and land treatment to alleviate flooding in the urbanizing Nonconnah Creek Flood Plain. They have also requested consideration of a closure at the mouth of Nonconnah Creek to prevent backwater flooding from the Mississippi River, with a pumping plant for interior runoff.

b. Recreation. Local interests have requested that one flood control structure be fully developed for recreation. They foresee park facilities adjacent to lakes formed by floodwater retention structures and along the streams passing through the urban areas. Attempt has been made to preserve a 600-foot wide strip, generally 300 feet each side of the main channel of Nonconnah for developement of a combination floodway-greenway. Some of the lands which would be a part of the greenway have been purchased by the Shelby County Conservation Board. Local sponsoring organizations have requested that the Corps of Engineers participate in recreation development in parks adjacent to floodwater control structures, and in the proposed greenway development.

c. Erosion and Sediment Control. Local sponsors are aware of the need for watershed protection and have requested a comprehensive basin-wide program of land treatment to control erosion and sediment damage. They have requested the Soil Conservation Service to design such a program that would reduce direct damages by erosion and sediment, reduce maintenance and operation costs of structural works of improvement, and contribute towards control of run off from lands in the watershed.

34. FLOOD PROBLEMS

a. Backwater Flooding From The Mississippi River. Approximately 6,400 acres below U. S. Highway 51 are subjected to flooding by backwater from the Mississippi River. The extent and frequency of flooding is recognized by those who would develop in this area. There has been very little encroachment into the Mississippi River overflow area, and average annual damages to existing development are low.

b. Headwater Flooding. Runoff from rainfalls in upper basin areas concentrates rapidly in the flood plains of Nonconnah Creek and large tributaries such as Johns Creek. Rapid urbanization is increasing the runoff and creating threats of more severe flooding. Within the city of Memphis, a large part of the flood plain has been filled and developed, displacing potential flood plain storage and creating more serious threats of flooding on previously developed lands on the periphery of the flood plain. Urbanization has increased runoff such that many areas of land previously filled to elevations above flood stages are again subject to inundation, and in some places previously flood free land is threatened with flooding. Urbanization is expected to continue throughout the basin, and there is a need to establish a system of flood control improvements to alleviate existing flood threats and permit orderly urbanization without creating additional flood hazards. Flood damage to crop and pastureland occurs mostly in the upstream tributaries of the watershed.

35. RECREATION

a. General. There have been several studies by various agencies at the local, state and Federal level which indicate needs for recreation facilities which can be incorporated into water resource development projects. Three of these are discussed below:

b. Tennessee Comprehensive Outdoor Recreation Plan, 1969. Region 8 in the report includes 12 counties in the southwest part of the state including the metropolitan area of Memphis and the Nonconnah Basin. The Plan states:

> In terms of number of resources and facilities showing need, Region 8 has the greatest needs. No facilities show idle capacity. In seven activities, Region 8 is short more than 1 million activity occasions. The largest deficit by far is in playing outdoor games, which shows a 1967 need of more than 9 million activity occasions. The 1967 swimming need is more

than 8 million occasions; fishing, more than 5 million; boating, more than 5 million; picnicking, 3 million; horseback-riding, 1 million; and small game hunting, 1 million.

c. Bureau of Outdoor Recreation Study. BOR did an interim demand, supply, and needs study for outdoor recreation in the Chickasaw-Hatchie River Basins, an area which contains the Nonconnah Basin. The BOR study shows need to provide opportunities for 3.2 million activity occasions in boating, swimming, camping, and picnicking and 1.5 million man-days of fishing by the year 1980.

d. Parks, Recreation and Conservation Plan for Memphis and Shelby County. This plan by the Memphis and Shelby County Planning Commission first published in 1965 and since revised in 1972, calls for approximately 30,000 acres of additional park and open space land to be acquired and developed by 1990 to meet the needs of the residents of Memphis and Shelby County. Of this total 2,050 acres are needed for large urban parks, 14,132 acres for regional parks and 13,000 acres for greenbelts.

36. OPEN SPACE

In an urbanized metropolitan area such as exists and will be further developed in Memphis and Shelby County, there is a need to preserve areas of open space, woodland, and natural areas for recreation and esthetic purposes. For several years local planning and conservation agencies have been promoting the idea of establishing the needed open space along stream banks to be used for the dual purpose of floodways and greenways.

37. FISH AND WILDLIFE

Stream fishing in Nonconnah Creek is negligible because of frequent extended periods of low flow in upper channel areas. There is a need for development of lakes for fishing as evidenced by the large numbers of sportsmen who travel regularly from the Memphis area to existing lakes in adjacent areas. Changes in land use from rural to urban are resulting in the loss of habitat for wildlife.

38. WATER POLLUTION

In the past years the lower reaches of Nonconnah Creek have been polluted by leakage from the city sewer system and from industries which dumped into the creek. The city has recently completed construction of a new interceptor sewer which parallels the creek and industries

are stopping or reducing the discharge of chemical wastes into the stream. These measures should result in dramatic improvement of water quality.

Several tributaries entering the stream near the city limits presently are often severely discolored by gravel mining and washing operations in the south central area of Shelby County. These operators are being required to install new technologies for sediment control in order to obtain permits for continued operation. As additional standards of state and Federal water quality control agencies are met, pollution from this source will be substantially reduced or eliminated.

Sediment pollution from other sources is discussed in paragraph 39.

39. EROSION AND SEDIMENT

Continuous cultivation on the rolling and steep uplands, the lack of adequate cover on the grasslands and poor hydrologic conditions of the woodland have contributed to the loss of top soil.

Land being held for development or speculation is often left idle or farmed very intensively to maximize returns. Little concern is attached to soil protection or runoff control. About 7,000 acres of this land erodes at an annual rate of 10 to 15 tons soil loss per acre.

The rate of soil loss rises sharply when grading, shaping, and excavation for construction takes place. Soil losses may approach 250 tons per acre annually, creating severe sediment damage and polluting streams. Development is initiated on about 1,500 acres each year.

Erosion and sediment problems are also found in established urban areas in overcrowded parks, poorly-kept yards, school grounds, utility rights-of-way, and in areas being razed for new construction. Undeveloped floodplain lands suffer scour damage and damage by deposition of sediment from upstream erosion.

The erosion of the fine-textured upland soils in this watershed has resulted in sedimentation within the floodplain area. Sediment deposition in the main and tributary stream channels is not significant; however, overbank deposition has caused some vertical accretion of the floodplain. This overbank deposition tends to build natural levees along the stream channels, increasing the area flooded and impedes the flow of floodwaters back into the channel system, thus

prolonging flooding and increasing damage. Sediment damage occurs to residential, commercial, and public buildings.

The extent of the erosion problem and its effect upon the watershed and McKellar Lake is shown in Tables 3 and 4.

TABLE 3

Areas of Erosion by Land Use

Kinds of Erosion	Cropland	Acres Pastureland	Forestland	Total
Sheet erosion				
Slight to moderate	13,600	11,700	5,535	30,835
Severe	14,380	7,000		21,380
Critical erosion	830	500	290	1,620
Gully erosion	140	60	40	240
Urban construction				1,500
Total	28,950	19,260	5,865	55,575

TABLE 4

Estimated Soil Movement By Erosion
Estimated Annual Soil Movement and Sediment
Delivered to McKellar Lake by Nonconnah Creek Watershed

Kinds of Erosion	Soil Movement (tons)
Slight to moderate sheet erosion	152,300
Severe sheet erosion	322,600
Critical area	67,300
Gullying	44,000
Roadbanks	8,000
Urban construction	300,000
Total erosion	894,200
Delivery rate factor	0.10
Delivered to McKellar Lake	89,400

SECTION XI - PLAN FORMULATION

40. GENERAL

Studies of water and related resources within the basin were made concurrently by the Corps of Engineers and the United States Department of Agriculture to determine needs and develop a totally coordinated comprehensive plan.

Plan formulation was based on the following objectives: (1) reductions in erosion rates through establishment of soil and water conservation measures in the uplands, (2) flood prevention by eliminating flooding from the 100-year flood on a major portion of the floodplain, (3) development of outdoor recreation facilities to help meet the recreational needs of the area, (4) improvement in the overall environmental quality of the watershed, and (5) sound development and use of the floodplain land for open space, industrial, commercial, and residential areas.

Physical characteristics of the basin vary considerably between the urban and rural areas. Therefore, the main stem was divided into two separate reaches for study purposes, and the major tributaries such as Johns Creek were considered as separate areas. The various water resource needs and development opportunities were evaluated for each area. Careful consideration was given to desires and suggestions of local sponsors, planning agencies of all governmental levels, and individual persons and private organizations. Data from previous studies and estimates of cost and benefits based on readily available information were used to eliminate clearly infeasible projects and to determine those for which detailed cost and benefits should be computed. For these projects, detailed estimates of costs and benefits were developed for improvements in each area and evaluated incrementally to develop the most desirable comprehensive plan of development. The future environmental setting in the Nonconnah Creek Basin in the absence of proposed modifications will be characterized by increasing urbanization, increased runoff, greater threats of flooding, and more damageable property in floodplain areas. The only practicable program of resource development and utilization in the Nonconnah Basin is one which will satisfy needs of diverse but compatible cultural, environmental, and economic nature. Needs for open space, recreation, enhancement of fish and wildlife in an urbanizing area, and the public utility of these values must be preserved along with a plan of continued urbanization and protection of property owners by an adequate system of flood control. Archaeological sites were considered during project formation. Arrangements will be made for more detailed surveys and, if necessary, for salvage operations prior to construction.

41. IMPROVEMENTS CONSIDERED FOR CONTROL OF BACKWATER FLOODING

Local interests requested that consideration be given to installation of a gated closure across the mouth of Nonconnah Creek to prevent water

from backing up Nonconnah Creek during periods of high stages on the Mississippi River. During periods of low river stages, headwater flow would pass by gravity through the opened gates in the closure. During periods of high river stages, the gates would be closed, and it would be necessary to pump headwater flow over the closure into the river.

Developed lands within the Mississippi River flood area adjacent to the north banks of Nonconnah Creek are already protected by the existing Nonconnah Levee and Pumping Plant. There is little development within the area subjected to flooding because of the known frequency and threat of flooding.

A large part of the 6,400 acre flood area would be required as a sump area for operation of the pumping plant. Total cost of the closure and pumping plant would be in excess of $15,000,000, with an average annual cost of more than $900,000. Damages from a 100-year frequency backwater flood would be less than $100,000 on existing property, and average annual damages are small.

During recent years there has been some development in the backwater area on land fills raised above flood levels. Continued development on land fills would likely be much more economical than the proposed closure and pumping plant. The closure and pumping plant would be quite expensive to construct and operate and would not be economically feasible.

42. ALTERNATIVES AVAILABLE FOR CONTROL OF HEADWATER FLOODING

a. General. There are several means which may be employed to reduce the discharge rate or effects of storm runoff, depending on characteristics of the individual drainage basin. The following paragraphs discuss the various structural techniques which may be used to control flooding, and the applicability of each to the Nonconnah Creek Basin.

b. Flood Control Storage. One of the most effective means of controlling runoff and subsequent flooding is the development of reservoirs to store excess runoff during and following periods of heavy rainfall. The structures are operated to reduce the discharge rate by gated control, storing excess runoff to be released gradually over a period of several hours or days following a heavy storm. The discharge rate can often be controlled to levels within the capacity of the downstream channel, or to reduce the extent of channel enlargement needed downstream to effectively control flood levels.

Storage structures are considered by many to be the most desirable means of flood control in the Nonconnah Creek Basin because of multiple uses such as recreation, and fish and wildlife development which can be incorporated into the lake development. Sites for large structures are limited in the Nonconnah Creek Basin because of topography and extensive improvements in some potential sites. There are several sites for smaller

structures on various tributaries. A total of 18 sites were considered in various combinations by the Soil Conservation Service and the Corps of Engineers. Many of these would have some effect on tributaries immediately below damsites, but would not provide adequate protection on main stem floodplains. Those structures which appeared to be feasible were evaluated in detail as discussed in following paragraphs.

A variation of flood control storage which may be considered in some areas is the use of dry dams. This type of structure would not include any permanent water storage, but is drained completely dry following each rainfall.

Such structures are often used in arrid areas where lakes cannot be maintained because of extended regular seasons of complete drought, and soil conditions are not conducive to formation of mud flats. In the Nonconnah Creek Basin, such structures are not considered desirable. Project costs would be essentially the same as a structure with permanent storage, but would provide no opportunity for any recreation use. Such a structure would also result in extensive mud flats and weed control problems because of frequent rainfall throughout the year. Mosquito control and other environmental problems would be significantly increased.

c. Channel Improvement. It would be possible in the Nonconnah Creek Basin to reduce flood levels by increasing the capacity of Nonconnah Creek to carry flood flows. There are many factors which must be considered in the Nonconnah Creek Basin in design of channel improvement, such as, water velocity and the ability of earth channels to withstand velocities without scouring, and the network of roads, bridges, and utilities which would require extensive protection or replacement by channel enlargement. In the Nonconnah Creek Basin, channel banks are alluvial material which is eroded by water velocities greater than four to five feet per second. Water velocities of more than five feet per second for several hours results in severe bank erosion, stream meandering, and subsequent silting and loss of stream capacity.

d. Levees. In some basins it is possible and feasible to confine floodwaters to a floodway by construction of earth levees or concrete floodwalls on each side and parallel to stream channels. In addition to confining flood flows to stream channels, such structures also restrict or eliminate flows from areas outside levees into main stream channels.

In the Nonconnah Creek Basin there are numerous tributaries flowing through highly developed areas often extending into main channel floodplains. Flow from these tributaries must not be restricted, otherwise runoff would accumulate in low areas outside levees and the flood control structures would become ineffective. To provide adequate flow from tributary areas into Nonconnah Creek with a levee system, it would be necessary to construct a series of collection systems and pumping plants

on each side of Nonconnah Creek to pump tributary drainage over levees. Such a system would clearly not be the most feasible plan for a densely populated area such as Nonconnah Creek.

e. Headwater Diversion. Very rarely is it feasible to direct flood flows from tributary areas above urban areas into adjacent basins, eliminating damaging flows through downstream floodplains.

In the Nonconnah Creek Basin, flows could be directed northward into the Wolf River Basin, reducing the discharge through the Nonconnah floodplain. Such a diversion, however, would require massive excavation to construct a channel approximately five miles across valuable property, through a ridge approximately 50 feet high, and would require construction of several bridges on major roads in east Shelby County. This alternative is clearly not a feasible means of controlling floods in the Nonconnah Creek Basin, and would contribute to an existing flood problem in the Wolf River Basin.

f. Rainfall Runoff Prevention. In some areas, particularly in basins with relatively narrow floodplains and a large number of well incised tributaries, it is possible to prevent rainfall from reaching main stem channels in quantities which would result in flooding, by a series of small runoff retardation structures. Such structures may be the equivalent size of agricultural farm ponds, and may be operated as "dry" reservoirs. This concept was suggested by several citizens in the Nonconnah Basin who object to large reservoirs.

The concept is generally more readily adaptable to a rural or agricultural area where a lower degree of flood protection is acceptable. In order to provide an acceptable level of protection in the Nonconnah Creek Basin, several hundred structures to produce lakes of 1- to 10-acres in size would be necessary. Sufficient sites at strategic locations are not available in the Nonconnah Creek Basin, and if they were, extensive costs of land use, construction of runoff controls, and operation and maintenance costs would be prohibitive as compared to larger flood control structures.

43. NON-STRUCTURAL ALTERNATIVES

a. General. There are several means of reducing flood losses through proper management of flood-prone areas and preparation for flood occurrences. While they may not be completely effective in areas where extensive development already exists, these means should be used to compliment structural alternatives, and eliminate the need for structural alternatives wherever feasible. These measures and their applicability to Nonconnah Creek are discussed in the following paragraphs.

b. Evacuation. Where adequate flood warning can be provided, damages and particularly loss of life can be reduced by evacuating areas subject to

flooding. There is extensive existing development in the Nonconnah floodplain, consisting of homes, commercial and industrial complexes, churches and schools. This property is not readily moveable.

Runoff from tributary area is rapid, and floods are concentrated into floodplains in a few hours, giving little time for warning and evacuation. It would be clearly impractical to suggest evacuation as a means of alleviating major damage in the Nonconnah Creek Basin.

c. Zoning. Zoning or controlling development in floodplain areas is an effective and economically efficient means of reducing future flood damages in many areas. In the Nonconnah Basin, there are several thousand homes, businesses, industrial, and commercial improvements existing in the floodplain. Zoning future development within the floodplain would not reduce the flood hazard to existing development. Approximately 75 percent of the existing and projected future flood damages will occur to existing development. If future development of business and home improvements within flood prone areas were eliminated by zoning, the rapid and continued urbanization of adjacent areas would still require that the flood prone stream valley be crossed and recrossed by transportation and utility systems. Zoning is clearly not practiced as the primary solution to flood problems in the Nonconnah Creek Basin. Land use control to provide a floodway or greenway by purchase of lands in fee title has been considered as an integral part of all structural flood control plans considered.

d. Flood Proofing. For many years the local governmental authorities have required a form of flood proofing for development in the Nonconnah floodplain in the forms of land fill requirements to raise improvements above known flood elevations. Increased runoff and decreased time of concentration for flood flows have resulted from development throughout the drainage area, and thousands of improvements which were safe from flooding at the time of construction are subject to inundation. There are a large number of individual dwellings in the Nonconnah floodplain, most of which cannot be made flood proof. Approximately 95 percent of the structures in the Memphis area, and particularly in the lower, more flood prone areas are constructed on concrete slab foundations with first floor elevations at or near ground level. Elevating such structures above existing and future flood levels would require a major reconstruction of each facility. Considering the fact that there are more than 3,000 such structures in the Nonconnah floodplain, it is apparent that flood proofing is not an economical means of reducing flood damages to existing development. Design and evaluation of structural alternatives considered for flood control in the Nonconnah Creek Basin were based on continued requirement for flood proofing in the form of land fills on floodplain lands to be developed in the future.

Other forms of flood proofing such as use of sand bags or other temporary means of eliminating water damages during a flood occurance are not practical because of the number of facilities to be flood proofed, the rapid

concentration of floodwaters following a storm, and limited time for installation of temporary flood proofing.

e. Land Treatment Measures. In areas such as the Nonconnah Creek Basin, where soils are comprised primarily of sediment, capacity of existing channels is often reduced by sediment accumulations from erosion. Land treatment should be considered as an integral part of any flood control plan to reduce rainfall runoff and erosion. It was agreed with the sponsors that a sound land treatment program was needed to assure full realization of potential benefits from structural measures and to minimize operations and maintenance costs. Land treatment alone will not significantly reduce flood damages.

f. Flood Insurance. The Memphis District, Corps of Engineers, is currently developing flood information to serve as a basis for a Federally subsidized flood insurance program for homeowners in the Nonconnah floodplain. The insurance program will not prevent major loss of existing improvements, but will protect individual homeowners from catastrophic personal loss. The insurance program will require strenuous controls on future development in flood areas.

g. Floodway Preservation. One of the most desirable and effective means of reducing potential flood levels, particularly in areas expected

to urbanize, is to restrict development within a part of the natural floodplain to provide for some overbank flow and maintain some flow capacity of the natural floodplain.

During the past several years, local interests have attempted to restrict development within a 600-foot strip along the existing channel of Nonconnah Creek. There has been no legally binding restriction, but development within that area has been successfully accomplished by negotiation with landowners. In some reaches the land within the 600-foot strip has been purchased by local government. The purpose of the restriction is to provide for some overbank flow, and reduced requirement for channel enlargement. Below Mt. Moriah Road, mile 12.4, most of the lands immediately adjacent to the 600-foot area are developed on land fills. The land fills installed over the years have been based on historical flood elevations, and do not meet elevations of current or future flood levels, which have been increased by urbanization and increased runoff.

Each of the flood control plans considered in this study anticipates continued preservation of the 600-foot floodway through land use control or purchase. Project alternatives are designed to reduce design flood elevations below existing fill elevations, and anticipates future land fill and development by private enterprise adjacent to the 600-foot area above Mt. Moriah Road.

44. RECREATION DEVELOPMENT

a. Recreation Development at Lakes. Consideration has been given to development of recreation areas in connection with proposed storage structures. Local sponsors requested that the Corps of Engineers consider development of recreation facilities adjacent to the proposed lake on the main stem of Nonconnah Creek.

In design of the lake, consideration was given to including storage for recreation which would provide a lake of suitable surface area; with a more desirable shoreline, and with the least fluctuation of lake levels during flood control operations.

b. Greenway Development. For several years local agencies have been planning toward development of a floodway-greenway along Nonconnah Creek to serve the dual purpose of providing overbank flow area during floods, and recreation and open space area during periods of low flow. These plans have been incorporated into the consideration of projects to meet flood control and recreation needs in this investigation.

45. EROSION AND SEDIMENT CONTROL

The needs for control of critical erosion on cropland and lands undergoing development were considered. Local sponsors are fully aware

of the need to control erosion and sediment to provide improved water quality for recreation, reduce sediment storage requirements and enhance the environmental quality. Tree planting, other vegetative treatment, and debris basins were suggested measures to reduce critical erosion and sediment problems.

46. NO ACTION

The alternative of no action is not acceptable in the Nonconnah Creek Basin. Failure to implement some plan for flood control will result in continued loss due to flooding on existing development, and increased damages as urbanization is increased. Without a flood control program, flooding can be expected in future years in several thousand homes, businesses, schools, and churches. The lives of many citizens in the floodplain will be affected by loss and inconvenience due to flooding. Continued urbanization without a project will also preempt needed developments for preservation of environmental values and recreation development. Unless measures are taken to preserve open space, natural values and recreation areas within the next few years, degradation of these values will continue, and the opportunity for preservation will be lost.

47. PLANS OF DEVELOPMENT CONSIDERED

a. General. Using the concepts for flood control and recreation applicable to the Nonconnah Creek Basin as outlined above, the Department of Agriculture and the Corps of Engineers, working with local sponsors and other agencies, have considered several plans to meet needs in the Nonconnah Creek Basin.

A sound program of land treatment for erosion and sediment control is considered a desirable and necessary feature of any structural plan for flood control, and should be included as a part of any alternative.

There are basically two means of reducing flood levels in the Nonconnah Creek floodplain, which can reasonably be considered. These are increasing the flow capacity of existing channels and floodwater storage.

On Nonconnah Creek it has been determined that any channel improvement which does not include reservoir storage will necessarily require channel paving to eliminate channel bank erosion. The soils which comprise the channel banks are highly erosive, and water velocities of more than four to five feet per second for any extended period of time will result in severe bank erosion. Without reservoir storage, the channel will be subjected to velocities of seven to eight feet per second for periods of time up to 12 hours. With reservoir storage, the duration of erosive velocities can be reduced to 4.5 hours, and with riprap protection of critical points along the channel and adequate

maintenance following flood flows, the channel can be maintained without paving.

On Johns Creek, flood control storage is considered the only practical means of effectively controlling flooding. Extensive urban development extending to the edge of Johns Creek, bank erosion problems as discussed above, and existing concrete paved sections of the creek make it impractical to consider channel improvement as a means of reducing flood levels. Backwater of Nonconnah Creek, at bankfull stage on Nonconnah Creek, will extend upstream in the Johns Creek channel for approximately two miles and would reduce the effectiveness of any channel enlargement in the lower reach of Johns Creek. However, this does not reduce the effectiveness of dams on Johns Creek. Three sites have been located in the Johns Creek headwater area which will contain sufficient combined storage to effectively control flooding in the Johns Creek floodplain. Development of these three sites should be included in any plan for flood control in the Nonconnah Basin. Effectiveness of the structures in controlling major flooding will be dependent on reduction of flood levels and backwater effects from the main channel of Nonconnah Creek.

The following paragraphs outline several alternatives which were considered to control flooding in the main stem floodplain and serve other needs in the Nonconnah Creek Basin.

b. Plan No. 1. This plan would consist of enlarging the existing Nonconnah Creek channel from McKellar Lake to the Johns Creek tributary, in combination with proposed land treatment and the three retention structures on Johns Creek.

Preliminary evaluation indicated that an enlarged earth channel would provide adequate flow capacity to reduce flood levels below Johns Creek. However, after more detailed investigation following a review of project alternatives, it has been determined that it would be necessary to pave the channel section to provide a maintainable channel. The channel without some means of headwater control will be subjected to water velocities of 7 to 8 feet per second for periods of time up to 12 hours following moderate to heavy rainfall. In order to prevent severe and repeated bank erosion under these conditions, it would be necessary to line the channel section with concrete.

A plan with channel improvement to Johns Creek, with concrete lining as necessary to prevent excessive erosion, is described as Plan 8 in this report.

Plan No. 1 would not provide needed protection for those areas in the floodplain above Johns Creek.

c. Plan No. 2. Project alternative No. 2 consists of a facility to store excess runoff in the main channel of Nonconnah Creek, in

combination with the land treatment program. A desirable and available site was located on the main stem approximately 20 miles upstream from the mouth of Nonconnah Creek. Sites further downstream would be more effective in controlling floods, but cannot be considered because of extensive existing development in potential reservoir sites. Sites further upstream would control less drainage area and be less effective in controlling floods. The Corps of Engineers and the Soil Conservation Service have considered a wide range of storage capacities and operational systems of flood control structures at this site. Consideration has also been given to the feasibility of supplemental storage at additional smaller sites upstream from the large structure. Storage can be developed at the site to adequately control flooding from the 100-year frequency flows down to Mt. Moriah Road, in addition to sediment storage for 100-year silt accumulation.

Tributary flows entering the main channel below the reservoir site are such that the structure would not adequately control major floods below Johns Creek.

Constructed and operated as a flood control feature, with no recreation storage or development, the lake would have a normal or conservation pool elevation of 314.2 feet above mean sea level, with 6,195 acre-feet of storage for sediment accumulation and a surface area of 1,200 acres. The lake would contain 18,000 acre-feet of flood control storage capacity. The top of controlled storage would be at elevation 323.3 feet above mean sea level.

Without channel improvement below Johns Creek, flooding in the Johns Creek floodplain cannot be effectively controlled because of backwater from Nonconnah Creek. This plan therefore does not include the Johns Creek structures, and would not benefit the Johns Creek floodplain.

d. Plan No. 3. In order to provide effective control of floods up to and including the 100-year return frequency storm, this plan would consist of the flood control structure as described in paragraph c above, channel enlargement extending from Johns Creek to McKellar Lake, and structures on Johns Creek. The 100-year design channel and flood storage structures would effectively control headwater flooding in the Johns Creek floodplain and in the main stem floodplain from the Nonconnah Lake site to McKellar Lake. The alternative as designed anticipates and includes preservation of a 600-foot wide floodway along Nonconnah Creek to provide overbank flow capacity for the larger storms. Required channel section for the 100-year design would be 110 foot bottom width to mile 9.3, and 90 foot bottom width to Johns Creek at mile 11.8, with 1 on 4 side slopes.

e. Plan No. 4. This plan would consist of channel improvement on the main channel of Nonconnah Creek extending from McKellar Lake 20 miles upstream, in combination with three structures on Johns Creek and a land

treatment program. The channel would be designed to provide adequate protection in the Nonconnah floodplain from storms up to and including the 100-year frequency occurrence without flood control storage on the main stem of Nonconnah Creek.

A preliminary investigation indicated that an enlarged earth channel could be constructed which would provide adequate flow capacity to reduce flood levels in the Nonconnah Creek floodplain. However, more detailed investigation shows that the improved channel without some means of headwater control will be subjected to velocities of 7 to 8 feet per second for periods of time up to 12 hours following moderate to heavy rainfall. In order to prevent severe and repeated bank erosion it would be necessary to line the channel section with concrete.

A plan with channel improvement to mile 19.8 with concrete paving as necessary for erosion control is described as Plan 10 in this report.

f. Plan No. 5. This plan would consist of an enlarged earth channel to mile 19.8, as described in Plan 4 above, in combination with Johns Creek Structures and land treatment program for flood control, and development of the 600-foot greenway from McKellar Lake to mile 19.8 for recreational use.

Detailed analysis indicates that without reservoir storage, water velocities will be excessive, and the earth channel and greenway cannot be adequately maintained.

g. Plan No. 6. This plan would consist of flood control storage in Nonconnah Lake and the three structures on Johns Creek, channel enlargement below Johns Creek, the land treatment program, with additional storage in Nonconnah to provide a suitable development for recreation and development of park facilities adjacent to Nonconnah Lake and within the 600-foot wide floodway-greenway.

The recreation storage in Nonconnah Lake would provide a dependable surface area of 1,900 acres, lake depths suitable for fish production, and the most desirable shoreline for recreation development. The normal or conservation pool would be at elevation 318.8, with a total storage of 13,100 acre-feet consisting of recreation storage of 6,905 acre-feet, and storage of 6,195 acre-feet for sediment accumulation.

Recreation developments would consist of a large park facility on the south bank of the lake, a smaller park north of the lake, and development within the 600-foot greenway extending from the Nonconnah Lake to the mouth of Nonconnah Creek at McKellar Lake.

This alternative has been identified as best meeting total needs of the basin, and is described in Section XII as the recommended plan of development.

h. Plan No. 7. Plan No. 7 would consist of the land treatment and storage structures as described in Plan 3 above, with a modified channel improvement design to lower channel maintenance costs. The modified channel section would extend from McKellar Lake to Johns Creek, and would consist of a "V" shaped earth channel section approximately 25 feet deep with 1 on 12 side slopes, a top width of 600 feet, and an 80 feet wide paved invert in the channel bottom.

The flat slopes would permit maintenance with riding mowers and the paved invert would be designed to carry low flows and prevent undercutting of channel banks. Maintenance costs would be significantly reduced by this design, but initial construction costs would be considerably greater.

i. Plan No. 8. Plan No. 8 would consist of improved channel capacity on Nonconnah Creek from McKellar Lake to the Johns Creek Tributary, in combination with land treatment and the three retention structures on Johns Creek. In order to maintain a stable channel which would not erode under excessive velocities for several hours duration following moderate to heavy rainfall, the channel would be lined with reinforced concrete. There are several alternate cross sectional configurations which could be developed to provide flow capacity. Estimates of cost as presented in this report are based on a channel section averaging 56 feet bottom width, with 1 on 4 side slopes. The bottom would be paved with concrete, 15 inches thick, and the bank slopes paved with concrete 9 inches thick. This design provides a reasonable estimate of cost for a paved section which would have sufficient flow capacity in combination with overbank flow within the 600-foot floodway to carry design flows.

The design is based on required section to carry design flows, but would be difficult to construct because in many reaches of the stream the channel has been excavated to obtain material for constructing landfills, and is much larger than the concrete design section.

This plan would not provide protection for floodplain areas above Mt. Moriah Road.

j. Plan No. 9. This plan would provide land treatment, three control structures on Johns Creek, and a concrete lined channel from McKellar Lake to Johns Creek, mile 11.8, as described in Plan 8 above, with enlargement of the existing earth channel from Johns Creek to mile 19.8. This design would provide for erosion control below Johns Creek, but could not be adequately maintained above Johns Creek because of erosive velocities extending over a period of several hours following moderate to heavy rainfall.

k. Plan No. 10. Plan No. 10 would consist of land treatment, three floodwater control structures on Johns Creek, and improved channel capacity with a paved concrete channel extending from McKellar Lake to mile 19.8. This plan is designed to provide equivalent flood control protection without reservoir storage on Nonconnah Creek. The concrete lining is necessary to prevent extensive erosion, as water velocities in an earth channel of sufficient capacity to carry design flows would range up to 7 to 8 feet per second for periods of time up to 12 hours, unless flows are reduced by reservoir storage. The design section is described in Plan 8 above.

48. COMPARABLE COSTS OF PLANS CONSIDERED

Table 5 shows the estimated installation cost and operation and maintenance cost for each separate feature of the various plans considered. No operation and maintenance cost is estimated for earth channel enlargements below Johns Creek without reservoir storage, as it has been determined that such enlargements cannot be adequately maintained without reservoir storage to reduce erosive velocity duration.

Table 6 shows a summary of first costs and annual charges for structural features included in the alternate plans of improvement.

TABLE 5

Estimated Installation and Operation and Maintenance Cost for Individual Project Features Considered in Plans for Flood Control and Recreation Development

	Installation Cost $	OM&R $
LAND TREATMENT	2,390,000	-
CHANNEL IMPROVEMENT:		
1. Trapezoidal Earth Channel to Johns Creek without Nonconnah Reservoir	15,371,000	1/
2. Trapezoidal Earth Channel to Johns Creek with Nonconnah Reservoir	14,695,000	416,000
3. Earth Channel to Mile 19.8 without Nonconnah Reservoir	23,838,000	1/
4. Earth Channel with Paved Invert & Flat Slopes to Johns Creek with Nonconnah Reservoir	36,910,000	166,000
5. Paved Channel to Johns Creek without Nonconnah Reservoir	60,000,000	150,000
6. Paved Channel to Johns Creek and Earth Channel from Johns Creek to mile 19.8	68,500,000	430,000
7. Paved Channel to Mile 19.8	93,000,000	250,000
FLOOD CONTROL STORAGE:		
1. Three Structures on Johns Creek	7,489,000	9,000
2. Nonconnah Flood Storage	24,663,000	150,000

TABLE 5 (Cont)

Estimated Installation and Operation and Maintenance Cost for Individual Project Features Considered in Plans for Flood Control and Recreation Development

	Installation Cost $	OM&R $
RECREATION FEATURES:		
1. Nonconnah Lake Recreation Storage (Separate Cost)	2,600,000	-
2. North Park	1,976,000	20,000
3. South Park	6,493,000	120,000
4. Greenway with Reservoir 2/	6,022,000	80,000
5. Greenway without Reservoir 3/	1,500,000	80,000

1/ Operation and maintenance costs are not estimated as it has been determined that this channel design cannot be maintained with design flow velocities and duration.

2/ Installation cost estimate includes purchase of 600-foot greenway from Johns Creek to mile 19.8. Lands below Johns Creek are included in channel improvement costs.

3/ Installation cost does not include land cost as those costs are included in channel improvement costs.

TABLE 6

Comparative Costs of
Plans Considered for Nonconnah Basin

Plan	Installation Cost	Average Annual Cost of Structural Features		
		Interest & Amortization	OM&R	Total
	$	$	$	$
PLAN 1				
Land Treatment	2,390,000	-	-	-
Structural Work	22,860,000	1,291,000	(Plan not engineeringly feasible)	
Total	25,250,000			
PLAN 2				
Land Treatment	2,390,000	-	-	-
Structural Work	24,663,000	1,393,000	159,000	1,552,000
Total	27,053,000			
PLAN 3				
Land Treatment	2,390,000	-	-	-
Structural Work	46,847,000	2,646,000	575,000	3,221,000
Total	49,237,000			
PLAN 4				
Land Treatment	2,390,000	-	-	-
Structural Work	31,327,000	1,770,000	(Plan not engineeringly feasible)	
Total	33,717,000			
PLAN 5				
Land Treatment	2,390,000	-	-	-
Structural Work	32,827,000	1,854,000	(Plan not engineeringly feasible)	
Total	35,217,000			
PLAN 6				
Land Treatment	2,390,000	-	-	-
Structural Work	63,938,000	3,612,000	795,000	4,407,000
Total	66,328,000			
PLAN 7				
Land Treatment	2,390,000	-	-	-
Structural Work	69,062,000	3,901,000	325,000	4,226,000
Total	71,452,000			

TABLE 6 (Cont)

Comparative Costs of
Plans Considered for Nonconnah Basin

Plan	Installation Cost	Average Annual Cost of Structural Features		
		Interest & Amortization	OM&R	Total
	$	$	$	$
PLAN 8				
Land Treatment	2,390,000	-	-	-
Structural Work	67,489,000	3,812,000	159,000	3,971,000
Total	69,879,000			
PLAN 9				
Land Treatment	2,390,000	-	-	-
Structural Work	75,989,000	4,292,000	439,000	4,731,000
Total	78,379,000			
PLAN 10				
Land Treatment	2,390,000	-	-	-
Structural Work	100,489,000	5,676,000	259,000	5,935,000
Total	102,879,000			

49. MAXIMIZATION OF NET BENEFITS

During plan formulation estimates of comparative costs and benefits were made to identify the plan which would provide the greatest excess of benefits over costs. The greatest net return would indicate the optimum scale of development. The topographic features of the basin and the urban development existing in the floodplain provides for few alternatives for flood control. Several channel designs with and without reservoir storage on the main channel of Nonconnah Creek were considered. Because of the urban nature of the flooded area, retention structures were not considered which would provide for less than the 100-year frequency flood occurrence. Table 7 below shows estimated annual costs, benefits, net benefits, and benefit-cost ratios for the various plans of improvement. Each plan shown is designed to provide protection from the 100-year flood occurrence for the benefited area. No estimates are shown for Plans 1, 4, or 5, as these plans contain earth channel design which cannot be recommended because of erosive water velocities without water control structures. Plan 2 provides for flood control on the main channel of Nonconnah Creek above Johns Creek only, and would not provide adequate protection for the lower reach of Nonconnah Creek or the Johns Creek floodplain. Plan 8 would not provide for flood control in the Nonconnah floodplain above Johns Creek. Plans 3, 7, 9, and 10 provide protection from the design flood for the Nonconnah and Johns Creek floodplains. Of these plans, Plan 3, which includes reservoir storage on the main channel of Nonconnah Creek would provide the maximum net benefit. Plan 6 consists of the basic flood control features of Plan 3, with additional development to provide for recreational use of the Nonconnah Reservoir and floodway lands.

All costs and benefits shown in Table 7 except Plan 2 include costs for three floodwater control structures on Johns Creek, and flood control benefits on Johns Creek. Eliminating the Johns Creek structures from any of the plans would reduce annual costs by $432,100 and benefits by $562,200, thereby reducing the net benefit.

In addition to costs and benefits for Plan 6 as shown in Table 7, estimates of costs and benefits for channel designs of 25-year and 200-year design frequency in combination with other project features were made to determine scale of improvement which would provide maximum net benefit.

Substitution of a 25-year design channel in lieu of the 100-year channel as shown would reduce annual charges by $91,400 per year, and annual benefits by $60,400 per year, with a slight increase in net benefits. However, the project with a 25-year design would not provide acceptable levels of protection for the urbanized floodplain below Johns Creek, and would also reduce benefits in the Johns Creek floodplain because of backwater effects.

Substitution of a 200-year design channel in lieu of the 100-year design channel as shown would increase annual costs by $50,600 per year, annual benefits by $14,600 per year, and therefore lower the net benefit.

Storage capacity of the reservoir site on the main channel of Nonconnah Creek is limited by topography. The flood control and recreation storage included in Plan 6 utilizes the maximum storage capacity. In order to increase the level of protection afforded by the reservoir, it would be necessary to utilize a part of the recreation storage for flood control, thus reducing level and area of the permanent pool. Approximately one-third of the recreation storage would be utilized by increasing flood storage to prevent overtopping the emergency spillway more than once every 200 years, and therefore provide protection from the 200-year flood. This would reduce permanent lake depths by 1.2 feet, and surface area of the permanent pool by 200 acres. The area of the flood control pool or the cost of the structure would not be changed by operation to provide for protection for the 200-year frequency flood. However, such operation would detract from the recreational value of the lake, as the loss in depth and area would reflect almost entirely in that part of the lake most useful for recreation. Such modification would provide little increase in average annual flood control benefit, and is not recommended at this time.

Plan 6 provides the maximum net benefit of all plans considered, and will provide minimum acceptable urban flood protection and recreation benefit.

TABLE 7

Benefit Maximization

Project Alternate	Annual Cost $	Annual Benefit $	Net Benefit $	Benefit/Cost Ratio
Plan 1	(Plan not engineeringly feasible)			
Plan 2	1,552,000	2,739,200	1,187,200	1.8
Plan 3	3,221,000	4,887,600	1,666,600	1.5
Plan 4	(Plan not engineeringly feasible)			
Plan 5	(Plan not engineeringly feasible)			
Plan 6	4,407,000	6,637,600	2,230,600	1.5
Plan 7	4,226,000	4,887,600	661,600	1.2
Plan 8	3,971,000	4,246,600	275,600	1.07
Plan 9	4,731,000	4,887,600	156,600	1.03
Plan 10	5,935,000	4,887,600	None	0.8

50. COMPARATIVE ANALYSIS OF ALTERNATIVE PROJECT FEATURES

a. General. The following paragraphs provide comparative descriptions of environmental aspects of the various project features of the plans considered. Each of the alternative plans have certain advantages and disadvantages with respect to the environmental effects and effectiveness in meeting needs for flood control and water resource development. In addition to project economics, during project formulation, consideration was given to selection of a plan to be recommended which will best serve the needs for environmental preservation and restoration in the urbanizing area, and be consistent with land use and long-range environmental development plans of local planning agencies.

b. Land Treatment. The land treatment program is considered as an integral part of any of the alternative plans for flood control. Emphasis will be placed on accelerating the conservation land treatment program on 35,010 acres during the installation period. Vegetative planting for wildlife will provide food and cover in many scattered locations over the watershed.

Stabilization of critical runoff and off-site eroding areas will not only reduce erosion and related off-site damages but will also greatly reduce the amount of land permanently lost to production due to the headward advancement of gully systems. The installation of 1,330 acres of critical area vegetative planting, 35 debris basins, 600 acres of critical area tree planting and the stabilization of 250 acres of critically eroding roadbanks by land treatment will be accomplished early in the installation period. The proposed roadbank stabilization will significantly reduce maintenance costs to county roads and future erosion damages to roadside fences would be negligible. Upland erosion will be reduced by an estimated 670,000 tons annually.

c. Flood Control Structures on Johns Creek. The three structures on Johns Creek are recommended to be constructed for the purpose of controlling flooding in downstream floodplains of Johns Creek and Nonconnah Creek. The three structures will be located in areas expected to be completely urbanized in the near future, and therefore construction of the lakes will have little net effect on plant or animal life. There are no feasible alternatives to construction of these three structures. The cost of enlarging the existing channel of Johns Creek would be prohibitive. Installation of the structures will require raising 6,800 feet of road, replacing three highway bridges and one railroad bridge, relocating four golf greens, raising 2,000 feet of railroad, providing access to two power line towers located in the pool areas, and remove six substandard houses.

Channel enlargement would require disruption of many residences which are located immediately adjacent to the existing channel, removal of existing paved channel sections, and contribute to flows in the main channel of

Nonconnah Creek below Johns Creek, and require more extensive enlargement in that reach. These three structures are designed to operate in conjunction with channel improvement on the main channel of Nonconnah Creek, and reduce backwater effects in the Johns Creek floodplain. All the alternative plans considered include the three Johns Creek structures except Plan 2, which does not include channel enlargement below Johns Creek. Plan 2 does not provide flood protection for the more than 800 residences in the Johns Creek floodplain which are subject to flooding.

d. <u>Channel Alteration Below Johns Creek</u>. It will be necessary to improve the flow capacity of the existing channel of Nonconnah Creek from McKellar Lake to Johns Creek, to provide an acceptable level of flood control. The extent of channel alterations depends on the use of upstream storage to reduce the peak design flows and duration of erosive water velocities.

Within this reach, almost all existing vegetation adjacent to the channel has been removed and in several reaches the channel has been widened and/or deepened by landowners to obtain borrow to fill adjacent floodplain lands. The borrow areas are generally left in unattractive appearance, and have resulted in severely eroded stream banks, and collections of debris and silt.

Alteration of the existing channel from McKellar Lake to Johns Creek will have no significant adverse effects on existing environmental values, but will result in improved appearance by clearing the existing channel of accumulations of silt, trash, and debris, and shaping and sodding of eroded banks and borrow areas.

Unless velocities and discharge rates are controlled by floodwater storage, it will be necessary to pave channel section to prevent further stream degradation by continued erosion. Paving the side slopes or channel bottom as included in Plans 7, 8, 9, and 10 would detract from the natural appearance of the stream and effectively prevent growth of stream organisms and restoration of natural conditions. Such alteration would not be compatible with other project functions, such as greenway development.

Improvement of the existing channel to provide a stable earth channel, as included in Plans 3 or 6, would enhance the appearance of the stream and provide favorable conditions for restoration of natural values. Channel alterations as proposed in this reach of Nonconnah Creek, in any of the alternate plans, will not interfere with traffic flow or any existing or proposed land use outside the 600-foot wide floodway. The floodway will be preserved for overbank flood flows.

e. <u>Channel Alteration Above Johns Creek</u>. Unless reservoir storage is provided to control flooding above Johns Creek, it will be necessary to alter the existing channel above Johns Creek to mile 19.8 to provide needed flood

protection. Flow capacity can be increased by enlarging the existing earth channel, or by constructing a concrete-lined channel to improve flow characteristics and prevent channel erosion.

Above Mt. Moriah Road there is an existing strip of forest land immediately adjacent to the channel on each bank in most of the 8-mile reach to mile 19.8.

Widening the channel to provide an enlarged earth channel as would be necessary with Plans 4 or 5 would destroy a large part of the existing natural growth. In addition, without some means of reducing discharge rates and velocities by upstream storage, an earthen channel, even with an intense maintenance program, would continue to erode and further destroy natural characteristics of the stream. Erosion would increase water turbidity and maintenance problems in channels further downstream.

Enlargement of the channel would not interfere with traffic flow or adjacent land use, but would require extensive protection measures to prevent washing out of bridges during flood flows.

A paved concrete section would reduce the extent of channel enlargement required, eliminate erosion, and therefore result in less direct effect on forest land adjacent to the stream. However, a concrete channel would detract from the natural appearance of the stream, eliminate growth of stream organisms, and restoration of natural stream conditions. A paved channel would not be compatible with other project functions, such as greenway development.

Any channel alteration on Nonconnah Creek between Johns Creek and mile 19.8, other than removing silt and debris from the existing channel, will result in degradation or destruction of natural environmental values which remain. However, there is little doubt that continuing urbanization will ultimately destroy these same values as it has below Johns Creek, unless measures are taken to preserve floodplain lands immediately adjacent to the channel.

f. Greenway Development. The establishment of a proposed greenway for a width of 600 feet along the creek below the reservoir would enhance the existing environment from an ecological and esthetic standpoint. By careful consideration of channel improvements and construction of greenway facilities, much of the natural flora can be preserved. Vegetation can be established on areas presently denuded. The greenway will not only form the physical limits of floodplain encroachment by developers, but will be a major factor in bank stabilization, soil erosion, and sediment control, thus directly benefiting the ecosystem of the stream.

Two rare species of terrestrial plants occur along Nonconnah Creek within the greenway zone, and thus can be preserved. Franseria Acanthicarpa is located about 200 feet from the stream bed on the east side of Kirby Road.

Iracopsis amplexicaulis is found 200 feet from the north side of the stream bed about 50 yards west of Lamar Avenue. Preservation of these two species will depend upon the prevention of the clearing and development of the location sites. The necessary protection would be provided with the establishment of the greenway. Every effort should be made to preserve these two species because they are the only known records of the plants in the state of Tennessee.

Another uncommon plant in west Tennessee is Ammannia auriculata (toothcup) found about 50 feet from the stream bed along Quince Road. While this plant is not rare it has been found locally only at the above location and at Meeman-Shelby Forest State Park in Shelby County.

Preservation of these rare or uncommon plants would be among the many purposes of greenway establishment and maintenance. The locations are spaced sufficiently apart so that each could become the focal point of a "nature study area" to go along with other study areas at selected sites along the creek.

There is little doubt that continuation of urban encroachment along Nonconnah Creek without some form of control will result in further degradation and erosion of existing and potential ecological values. Thus, implementations of the greenways concept would be a major factor in preserving and enhancing the floodplain resources for the use and enjoyment of future generations.

Greenway development would increase the environmental quality of the existing channel below Mt. Moriah Road by restoration of plant life on adjacent lands, and would preserve the existing forest land along Nonconnah Creek above Mt. Moriah Road to the proposed dam site.

Purchasing or obtaining easements on the greenway lands would insure preservation of lands adjacent to the creek for public use and preservation. Public use facilities to be included in development, such as nature trails, bicycle and horse trails, picnic areas, and open space, would provide opportunity for convenient outdoor recreation to thousands of residents adjacent to the stream as it passes through Memphis.

g. Nonconnah Flood Control Storage. The establishment of a flood control reservoir would have several beneficial ecological impacts. It would result in an increase in the diversity and number of aquatic organisms. It would improve the quality of downstream flows through assimilation and sedimentation.

Creation of the reservoir would have some adverse impact upon existing ecological conditions. Established terrestrial biota would be destroyed within the permanent pool area, including some 900 acres

of hardwood timber. Composition of aquatic life would be altered as a result of conversion from a stream to lake environment. However, the aquatic species diversity in Nonconnah Creek is small as a result of intermittent flows which precludes the sacrifice of many of the species which would normally be found under more natural stream conditions.

During preparation of the environmental inventory in 1972, one species of higher plant, Erythronium albidum (White Dog Tooth Violet) which is rare in Shelby County, was found in the vicinity of the proposed Nonconnah Reservoir. Subsequent investigation indicates that the plants at this locality have been destroyed by farming operations. This is not a rare species to science, occurring elsewhere in the state as well as in adjacent states to the west, north, and east. The two occurrences of this species in Shelby County represent the edge of its southerly range in the mid-south.

The permanent pool will be constructed to standards established for mosquito control by the Tennessee Department of Public Health. There will be some mosquito production on the periphery of the lake. Mosquito production will be reduced by maintaining minimum depth, and can be further controlled by introduction of natural predators. Mosquito production is not expected to be significant.

The segment of the existing Forest Hill-Irene Road through the lake between Shelby Drive and Winchester, and the segment of Shelby Drive through the lake between Forest Hill-Irene Road and Baily Station, including the intersection with Reynolds Road, will be closed with both bridges and road fill removed. This will result in some inconvenience and rerouting of traffic which normally uses these two roads. Bailey Station Road, Collierville Road, Holmes Road and other roads in the vicinity will not be interrupted.

Table 8 shows 1972 average daily traffic on roads in the vicinity of the lake, and estimated effects on traffic loads as a result of rerouting traffic.

The lake will not limit sewer or other utility service to any lands in the surrounding area. The trunkline sewer is proposed to parallel the north shoreline to serve the city of Collierville and all areas north and east of the lake by carrying waste discharge to a large treatment plant now under construction by the city of Memphis. A similar line can be installed to serve areas south of the lake.

Construction of the lake will cause the relocation of 16 families. Agricultural production on 2,700 acres of cropland and 1,700 acres of pastureland will be eliminated. The tax base of the county will be reduced by conversion of private land to public ownership. Lands which would be purchased for Nonconnah Lake now produce approximately $40,000 in annual revenue.

There are several archeological sites which will be affected by the Nonconnah Creek impoundment. These sites can be investigated and salvaged prior to lake construction.

There is no doubt that the existing environmental values which would be adversely affected by construction of the lake will be displaced or destroyed in future years by continued urbanization. Construction of the lake, however, would provide a catalyst for purchase of lands adjacent to the lake for public use, and thus provide for preservation of natural values and open space on those lands which surround the lake site.

h. Nonconnah Lake Recreation Development. Including recreation storage as proposed in Plan 6 would increase lake depths, thus creating more favorable conditions for fish production. The lake would have a larger surface area, with a more satisfactory shoreline for recreational use.

The lake would be operated to provide a minimum release of 3 cfs to maintain flow in the downstream channel. The constant flow would significantly reduce mosquito production in stagnant pools in downstream channels which exist several days each summer. The constant flow would also maintain a source of life for streambed organisms, and provide a more natural setting for greenway development in downstream channels.

Recreation development at the Nonconnah Lake would include approximately 1,600 acres of park land, which would provide open space in an area which will be urbanized in future years. There are some small patches of forest land and many scattered clumps of trees which would be preserved on lands to be developed as park areas. Additional forest land would be established in these areas by reforestation.

The lake and associated recreation development would provide opportunity for outdoor experience within a large population center, where many low income residents do not have money or time to travel to other facilities outside the Memphis area.

The recreation development and associated use will result in increased vehicular traffic on roads in the vicinity of the lake. Table 8 shows an analysis of traffic as a result of rerouting traffic on roads which will be closed, and traffic induced by recreation development. Resulting traffic will be well within design capacity of all affected roads.

Table 8

Traffic Analysis - Vicinity of Nonconnah Lake

	1972 ADT	Rerouting of Shelby Traffic 1/	Rerouting of Forest Hill Traffic 2/	Subtotal (Rerouting Effect)	Traffic Effect of South Park 3/ (1,650 Vehicles/Day)5/	Traffic Effect of North Park 4/ (1,380 Vehicles/Day) 5/	Total Traffic After Project
East-West							
Poplar Ave. (Hwy. 72)	11,670	-	-	11,670	410 (25%)	550 (40%)	12,630
Winchester Rd.	3,000	+405 (50%)	-	3,400	330 (20%)	690 (50%)	4,420
Shelby Drive	810	-	-	-	330 (20%)	280 (20%)	1,420
Holmes Rd.	1,160	+405 (50%)	+420 (90%)	1,980	250 (15%)	140 (10%)	2,370
North-South							
Hacks Cross Rd.	790	+405 (50%)	+420 (90%)	1,610	910 (55%)	410 (30%)	2,930
Forest Hill-Irene Rd.	470	-	-	-	-	550 (40%)	1,020
Bailey Station Rd.	273	+405 (50%)	-	680	80 (5%)	-	760
Byhalia Rd.	1,700	+405 (50%)	+50 (10%)	2,150	80 (5%)	-	2,230

1/ Based on 50 percent of traffic rerouted via Byhalia-Holmes-Hacks Cross Road and 50 percent by Bailey Station-Winchester.

2/ Based on 90 percent of traffic rerouted via Shelby Drive-Hacks Cross Road and 10 percent via Shelby Drive-Byhalia Road.

3/ Based on access distribution of: 25 percent via Poplar-Hacks Cross Road; 20 percent via Winchester westward - Hacks Cross Road; 10 percent via Winchester eastward - Hacks Cross Road; 20 percent via Shelby Drive westward; 15 percent via Holmes-Hacks Cross Road; 5 percent via Reynolds Road; 5 percent via Byhalia-Holmes.

4/ Based on access distribution of: 40 percent via poplar-Forest Hill; 20 percent via Winchester West; 10 percent via Winchester East; 20 percent via Shelby Drive westward - Hacks Cross Road-Winchester; 10 percent via Holmes-Hacks Cross Road-Winchester.

5/ Traffic estimate is double estimated peak vehicular attendance to account for movement to and from recreation areas.

SECTION XII - RECOMMENDED PLAN

51. GENERAL

Of the various plans considered, Plan 6 is recommended as the most desirable plan of development. Plan 6 contains the essential features of a program of development to meet needs for flood control, watershed protection, economic growth, outdoor recreation, open space, and environmental needs of the Nonconnah Creek Basin. It is sensitive to regional and national concern for preservation and enhancement of natural environmental values while including local needs for flood control in a rapidly urbanizing area. Sponsors have agreed that the recommended plan meets local objectives. It consists of a comprehensive watershed program to be implemented jointly by the Corps of Engineers, the Department of Agriculture, and the local sponsoring organizations. The Department of Agriculture will have responsibility for three floodwater control structures on the Johns Creek tributary and a basinwide program of land treatment for erosion and sediment control on 35,010 acres. The Corps of Engineers will have responsibility for construction of a floodwater control structure on the main stem to be developed for recreation, 7 miles of channel cleanout and 12 miles of channel enlargement within the city of Memphis, and development of recreation, preservation and enhancement of natural environmental values within a 600-foot wide greenway-floodway extending 20 miles from the mouth of Nonconnah Creek to the flood control structure on Nonconnah Creek above Hacks Cross Road. Detailed description of recommended project features are contained in the following paragraphs.

52. LAND TREATMENT

a. General. The plan includes an accelerated land treatment program for agricultural land, urban land, and land in transition from rural to urban. Land treatment measures are needed to improve the environment, control erosion, reduce sediment and support the overall flood control program. This acceleration of land treatment will require an intensive conservation education and information program aimed at users of both urban and rural lands.

Accelerated application of land treatment measures is planned for 35,010 acres of land. This includes vegetative planting of 1,330 acres of critically eroding land, tree planting on 600 acres of critically eroding land, 250 acres of roadside stabilization, and 35 debris basins.

Technical assistance will be provided to landowners for planning and applying safe land use and needed conservation treatment measures. Conservation plans will be developed with individual farmers and urban landowners in harmony with the overall land use and management plan for the watershed. These plans will meet the needs for sustained productive use of land for agriculture or planned urban use.

b. Cropland and Grassland. Most of the intensive farming exists in the upper reaches of the watershed with the production of soybeans, cotton, corn, wheat, nursery stock, dairy and beef products. There are also several horse farms and riding stables throughout the watershed. Continued emphasis will be placed on using the farmland resources in accordance with the land's capability.

Pasture and hayland will be the principal planned use of open agricultural land with slopes exceeding 12 percent and on some of the more eroded soils with slopes of 8 to 12 percent. It is estimated that 18,000 acres of pastureland and hayland will exist on upland and bottom lands in the watershed at the end of the installation period. Of this total acreage, approximately 16,000 acres are scheduled to receive needed grassland management which will provide adequate erosion control and the desired level of production. Grassland management will include such practices as pasture and hayland planting or renovation, rotational grazing or proper stocking rates to prevent overgrazing, liming and fertilizing according to soil tests, livestock water developments to provide better grazing distribution, and weed control.

Cropland farming will be limited generally to bottom land and upland soils with slopes of less than 8 percent. It is projected that around 32,000 acres will be used for cropland (including ornamental plant nurseries). Of this acreage, it is planned that approximately 26,500 acres will receive adequate conservation treatment. The universal soil loss predicting equation will be used as a guide in determining the needed conservation measures on sloping cropland. Conservation measures that will be used on sloping cropland will consist of such practices as conservation cropping systems, terraces, grassed waterways or pipe outlets, stripcropping, contour farming, minimum tillage, diversions, or combinations of these conservation practices which will keep soil losses within tolerable rates. Crop residue management, fertilization, and needed water management systems will be the principal conservation practices utilized on bottom lands used for cropland.

It is estimated that approximately 3,000 acres of sloping cropland will have terrace systems installed. Parallel, gradient, or diversion terraces will be used. A total of about 300 acres of protected outlets will be included, some of which will be pipe outlets and the remainder will be grassed waterways. Approximately 2,000 acres of crops will be grown using minimum tillage, primarily no-tillage systems. The remaining sloping upland planned to be adequately treated will be either contour farmed with conservation cropping systems or stripcropped.

c. Urban Land and Land in Transition. Urban land treatment will emphasize the establishment of permanent vegetation on homesites, vacant lots, public property, and all other open lands. It will include the establishment and maintenance of greenbelts for purposes such as sound screens, esthetic screens, recreational and park areas, water control, and sediment traps.

It is essential during the urbanizing process that developers and property owners minimize erosion especially during the construction phases. Measures required may be unique to each development. The sponsors are at present studying ways to strengthen existing regulations governing erosion controls and will, within their legal authority, develop policies and guidelines for the urbanizing areas. It is planned that land developers will be required to submit for approval a development plan which will also provide for sediment and erosion control during the development period. Such plans will include the following:

(1) Reduce by the greatest extent practicable the area and duration of exposure of readily erodible soils.

(2) Protect the soil by using temporary vegetation or mulch or by accelerating establishment of permanent vegetation. Vegetation will be established as quickly as possible after soil exposure.

(3) Temporary basins (debris basins, desilting basins or silt traps) will be built where needed to remove sediment and pollution from runoff waters from land undergoing development until permanent vegetation provides adequate protection.

(4) Storm sewers, culverts, bridges, etc. will be installed to effectively accommodate the increased runoff caused by changed soil and surface conditions during and after development.

(5) Permanent vegetation and structures will be installed as soon as practical in the development. As many trees as possible will be left before and after development.

(6) The development plan will be fitted to the topography and soils so as to minimize land grading and create the least erosion potential. These plans will also include provisions for tree belts, green spaces, nature parks and open space areas.

(7) When areas are idle due to transition from agricultural land use to urban land use, natural vegetation will be retained or improved to the extent that no damaging erosion can take place. Sediment basins will be constructed if needed to remove sediment from runoff waters. So far as possible the area will be maintained in a state that will not detract from the surrounding landscape.

d. Forest Land. Additional technical assistance will be made available to the landowners to accelerate the application and improve the effectiveness of forestry practices to be applied to the land. In harmony with sound watershed management, forest land plans and forestry measures will be applied so as to produce the most desirable combination of wildlife, recreation, timber, esthetics, and other environmental factors.

A practical product of the proposed land treatment practices will be the development, preservation, and enhancement of well-defined and effective forest buffer strips. As a minimum, these buffers strips will ameliorate the harsh impact of urbanization by trapping sediment, stabilizing soils on undeveloped open areas, reducing noise, serving as screens, and providing the recreation and esthetic values inherent in forest lands. In short, a bonus of good watershed and woodland management can be the production of the humane city. The planned forest land treatment measures are: 600 acres of critical area tree planting, 3,200 acres of tree planting for watershed protection and enhancement, and 2,000 acres of stand improvement measures.

(1) Tree Planting - critical area (600 acres)

Site preparation and revegetation of 600 critically eroding acres is necessary to stabilize soils and reduce the flow of sediment into the already overloaded stream channels.

(2) Tree Planting - watershed protection (3,200 acres)

Interplanting of 800 understocked acres and afforestation of 2,400 acres is necessary not only to bring present forest land to its potential, but to provide needed forest cover on areas not now in trees. The combination of improved canopy cover, undergrowth, and forest floor conditions resulting from these practices will reduce runoff, erosion, and sedimentation. At the same time, they will hasten the development of the cool, shady forest, desirable both hydrologically and esthetically.

Plans for these future woodlands will include careful consideration of esthetic and environmental enhancement measures such as screens between residential areas and adjacent noisy and dirty highways, railways, airports, and industrial areas. These newly forested lands will also serve as greenways and potential recreation sites for parks.

(3) Urban Forest Improvement Measures (2,000 acres)
These are measures which will not only improve the hydrologic capabilities of the forest soils but also enhance the esthetic, wildlife, and other facets of forest environment which need to be incorporated into the city's woodlands. Insect and disease control, damaged tree removal, harvesting assistance, improvement cutting, provision for planned and maintained access, and many other forestry practices will be necessary to maintain the most effective forest cover.

Projected urban and industrial development will create an erosion and sediment problem over and above that which might be expected for an agricultural watershed, unless special erosion control measures are applied during the critical construction period. As temporary relief until growth of such areas is adequate to function satisfactorily, such measures as temporary debris and silt basins, seeding exposed soil to grasses and legumes, mulching, and temporary diversions may be desirable. These special measures are in addition to the protection and management of existing woodland within and adjacent to urban areas already developed.

e. Critically-Eroding Land. An estimated 1,330 acres of critically-eroding areas within cropland and grassland fields will need vegetative treatment to control sediment production. These areas will be treated by establishing perennial grasses and legumes or stabilized by planting to trees.

About 240 acres of these critically-eroding lands are in gullies and will need treatment by one of the following methods:

(1) Areas with mild gully problems will be controlled by shaping and seeding. Such areas are normally found in land best suited for hay or pasture where treatment with trees is impractical.

(2) Areas with moderate gully problems will be controlled with a combination of small brush dams, seeding with appropriate grasses, grass and legume mixtures, or tree planting.

(3) On areas of severe gully erosion where the immediate elimination of sediment is required, an earth dam with a drop inlet structure will be constructed at the lower end of the gully as the upper part of the gully is treated with grass and legume seeding, brush dams, and tree planting.

About 250 acres of 70 miles of critically-eroding roadbanks will be stabilized. Roadbank slopes need to be reduced and the area stabilized by vegetation such as bermuda grass, fescue, or sericea lespedeza and love grass. Roadbanks may be planted with flowering shrubs or other ornamentals to improve the esthetic beauty of the landscape.

Sand and gravel pits will need to be shaped to conform as nearly as possible to the natural land surface when no longer in use. Vegetation such as perennial grasses and legumes will be established or the area planted to trees.

The wildlife needs of food, cover, and water will be provided as a part of the adjustments in land use and land treatment program in the watershed. Individual landowners will be provided technical assistance in planning and carrying out practices that will enhance the supply of wildlife food and cover on the farms. A timber management program which favors woodland wildlife habitat will be encouraged and recommended. Wildlife habitat improvement will include the establishment of plantings for food and cover along field borders, streambanks, drainage ditches, fences, and other open areas.

The selection of land treatment measures to be installed will be determined by the needs, desires, and objectives of the landowners and operators and will be influenced by land use, economic conditions, acreage controls, customs, trends, conservation needs, and needs for flood reduction.

53. FLOOD CONTROL STRUCTURES

The recommended plan includes three single-purpose floodwater retention structures which would be constructed by the Soil Conservation Service on the Johns Creek Tributary, and one multiple-purpose structure which would be constructed by the Corps of Engineers on the main channel of Nonconnah Creek.

a. Johns Creek Structures. Three single-purpose floodwater control structures for installation by the Soil Conservation Service are shown on Plate 2 as sites 11, 15, and 17. These dams are on the headwaters of Johns Creek. They will store 6 inches of runoff from a 15-square mile drainage area. Structure 15 will have a two-stage principal spillway. The principal spillways and intakes are proportioned so that flows through the emergency spillways will occur only when conditions are met that exceed the discharge computed for the 100-year frequency rainfall.

Provisions are made in all structures for storing the sediment from a 100-year yield. The crest of the principal spillway in the three single-purpose structures will be set at an elevation equivalent to the 100-year submerged sediment storage. The earth embankment of the dams

will be built mostly from silty clay material. Principal spillways for the dams will consist of a reinforced concrete riser and a prestressed concrete pipe with metal core. A metal slide headgate is located near the bottom of the riser to facilitate lowering the water level for vector control and draining of the reservoir as needed. Emergency spillways will be excavated in earth and vegetated on sites 11 and 15. A concrete chute emergency spillway will be used on site 17. Engineering and structural data are shown on Table 9. The Johns Creek Structures will be owned by the Chickasaw Basin Authority and will have public access. Sanitary facilities will be installed by the sponsoring local organization using Federal construction funds. All areas disturbed during construction of the dams will be revegetated with grasses or other suitable plants to control erosion.

Construction contractors will be required to adhere to strict guidelines for minimizing soil erosion and water and air pollution during construction. Safety and health regulations will be carried out by contractors for the protection of the general public. Shoreline conditioning of the pool area at all of the structure sites will be required where needed to conform with state regulations for vector and insect control.

b. <u>Nonconnah Creek Structure</u>. A multiple-purpose structure for flood control and recreation will be constructed by the Corps of Engineers and developed for recreation in cooperation with the Chickasaw Basin Authority. The structure will be located approximately 19.8 miles upstream from the mouth of Nonconnah Creek as shown on Plate 2.

The reservoir will contain sediment storage for 100-year accumulation, a total of 6,195 acre-feet. Recreation storage of 6,905 acre-feet will be included to provide adequate area for recreation use with the most desirable shore line. Elevation of the recreation pool will be 318.8 feet msl, with approximately 1,900 acres surface area. Flood control storage of 18,000 acre-feet will be included to reduce discharge from 25,000 cfs to 2,100 cfs for the 100-year frequency flood.

The emergency spillway elevation will be elevation 326.0, the top of controlled flood storage. The top of the dam will be at elevation 339.0, to provide for safety in passing the maximum probable flood, plus a reasonable freeboard. The site will be developed to maximum potential with the top of the dam at elevation 339.0. Additional engineering data is contained in Table 9. Construction of the reservoir would require purchase of approximately 5,000 acres of rights-of-way, relocation of approximately 16 families, and possible relocation of one cemetery containing about 200 graves. Two improved county roads would be closed to through traffic, Forest Hill-Irene Road running north and south, and Shelby Drive running east and west.

The proposed lake on the main channel of Nonconnah Creek will be designed and operated as a multiple purpose facility for flood control and recreation development. Because of potential recreation use, there is concern about water quality, depth, and other aspects which will affect the desirability of the lake. The following subparagraphs discuss several environmental quality aspects of the lake and associated park developments.

(1) Water Quality. Soils above the proposed lake are erosive, and therefore there is concern about such factors as turbidity and sediment. During the period March through June 1972, water samples from tributaries which will flow into the lake were taken weekly, and following occurrences of heavy rainfall. This time period includes the season of greatest agricultural activity. Samples were tested for color, turbidity, and sedimentation rates. In addition to the weekly samples at the lake site, grab samples were taken downstream and tested for pH, color, turbidity, suspended solids, total solids, dissolved solids, volatile solids, alkalinity, sulfates, phosphates, dissolved oxygen, chemical oxygen demand, biochemical oxygen demand, and phenols. All tests were made according to standard methods for water and waste-water analysis. Water at the site of the proposed dam exhibits an acceptable dissolved oxygen content, a low BOD and COD, and acceptable levels of the other parameters measured.

With upstream land treatment programs for erosion and sediment control proposed as a part of the recommended plan, water quality after project installation will be improved over that found in the tested samples.

As the area above the lake is urbanized, it will be necessary to take adequate measures to prevent excessive erosion from construction activity, and excessive turbidity during the development period.

At the present time, fecal coliform counts in water flowing into the lake area are greater than those permitted by standards established by state and local health agencies for body contact sports. As standards for control of wastewater discharge are met, and use of lands for livestock production is changed by urban development, the source of contamination may be substantially reduced.

The fecal coliform count will not create adverse conditions for other lake uses, and will not be objectionable from the standpoint of odor, discoloration, or other unsightliness. The lake will have substantially less contamination than found in tests of tributary flows because of dilution and assimilative action.

(2) Depths and Fluctuation of Lake Levels. The bottom of the lake will be excavated prior to filling above elevation 316 as necessary to provide minimum conservation depths of three feet, with one on three side slopes to the water's edge. This design will conform to the Tennessee Impounded Water Act.

The water depths in the lake will range from three to 18 feet, with depths of 30 to 40 feet within existing channels which will be inundated. These depths will be completely satisfactory for production of fish. Concentrated efforts will be necessary to control weed growth in shallow areas of the lake. There will be approximately 500 acres of surface area approximately three feet in depth. The lake bottom in this area will be excavated to an uniform depth and weed growth can be adequately controlled by periodic mowing using an underwater sickle bar mower operated from a boat. The average depth of Nonconnah Lake will compare to existing lakes in adjacent basins well known for their recreational value.

There are no constant sources of water supply into the lake area, and therefore lake levels will fluctuate, depending on rainfall, evaporation, seepage, and rate of discharge.

During the drier months of the year, evaporation may exceed inflow, reducing lake levels and depth. Based on available runoff records and standard evaporation rates as established by the U. S. Weather Service, maximum fluctuation of one-half to one foot can be expected in any given year because of evaporation. The seepage rate can be expected to be about 0.8 foot per month initially, assuming no inflow, and will be reduced to less than 0.4 foot per month within a period of time as the ground water content is increased and sedimentation fills the porous lake bottom.

A constant release of approximately three cfs will be made during the dry season to maintain a constant flow in the channel downstream from the lake. This discharge will reduce lake levels less than 0.2 foot per month, assuming no inflow.

Balancing total average losses due to evaporation, seepage, and discharge releases against average monthly inflows indicate that maximum reduction in lake levels will be approximately one foot or less during drier months. Flood storage area above the conservation pool will be graded and maintained to prohibit formation of potholes which would contribute to mosquito production.

Following periods of heavy rainfall, water levels will fluctuate above the conservation pool level. Normal variations in lake levels because of runoff accumulation will be less than four feet, and will require about 1-1/2 days to return to conservation pool stage. This duration will not destroy vegetation and "mud flats" will be minimum.

Following a 100-year frequency storm, or on the average of once every 100 years, lake levels will rise to elevation 326, the top of controlled storage. Approximately 4-1/2 days will be required to return to conservation pool elevation from the 100-year flood pool assuming there is no major inflow during that time.

Water level fluctuation will not affect access to the lake from adjacent park facilities.

(3) Fish Production. Two significant measures of fishing potential are drainage area above the lake and water depths. The optimum ratio of watershed area to lake surface area for fish production is 9:1. This insures adequate supply of fresh water without carrying excessive water through the lake and flushing out food organisms. In larger lakes, ratios of 20:1 to 30:1 can be expected to produce good fishing. The watershed ratio of the Nonconnah Lake will be 18:1. Depths of three to 18 feet as will exist in Nonconnah Lake will be completely satisfactory for fish production.

To enhance fishing, intermittent strips of flooded timber will be retained in the lake between elevations 308 and 312, subject to approval of the Tennessee Department of Public Health.

(4) Dam Stability Analyses. The retaining structure for the proposed lake will be designed to withstand the maximum probable storm without being overtopped, plus a reasonable freeboard. The proposed lake is in a Zone III earthquake area, and must be designed to that standard. Appendix E to this report presents a detailed analysis of the possibility of dam failure due to earthquake vibrations.

TABLE 9 - STRUCTURAL DATA
STRUCTURES WITH PLANNED STORAGE CAPACITY
Nonconnah Creek Watershed, Tennessee and Mississippi

Item	Unit	Nonconnah Lake	Johns Creek Structures			Total
			11	15	17	
Class of Structure			C	C	C	
Drainage Area	Sq.Mi.	53.24	5.43	1.59	7.90	68.16
Curve No. (1 day)(AMC II)			80	80	80	-
Tc	Hrs.	5	1.16	0.63	1.27	-
Elevation Top of Dam	Ft.	339.0	337.6	349.0	331.0	-
Elevation Crest Emergency Spillway	Ft.	326.0	328.9	342.3	322.3	-
Elev. Crest High Stage Inlet	Ft.	-	-	338.90	-	-
Elev. Crest Low Stage Inlet	Ft.	-	321.5	335.0	315.0	-
Maximum Height of Dam	Ft.	37	35	28	32	-
Volume of Fill	Cu.Yds.	1,400,000	153,000	86,000	190,500	1,829,500
Total Capacity	Ac.Ft.	31,100	2,143	739	3,004	36,986
Sediment Submerged 100 Yrs.	Ac.Ft.	5,550	611	188	735	7,084
Sediment Aerated	Ac.Ft.	645	85	26	21	777
Beneficial Use (Recreation)	Ac.Ft.	6,905	-	-	-	-
Retarding	Ac.Ft.	18,000	1,447	525	2,248	22,220
Between High and Low Stage	Ac.Ft.	-	-	242	-	242
Surface Area						
Sediment Pool	Acres	1,200	150	47	200	1,597
Beneficial Use Pool (Rec.)	Acres	1,900	-	-	-	-
Retarding Pool	Acres	3,280	247	98	430	4,055
Principal Spillway						
Rainfall Vol. (Areal)(1 Day)	In.	7.9	7.9	7.9	7.9	-
Rainfall Vol. (Areal)(10 Day)	In.	-	14.5	14.5	14.5	-
Runoff Volume (10 Day)	In.	-	9.57	9.57	9.57	-
Capacity of Low Stage (Max.)	Cfs	-	267	42	326	-
Capacity of High Stage (Max.)	Cfs	-	-	92	-	-
Frequency Operation-Emerg. Spillway	% Chance	1	1	1	1	-

TABLE 9 - STRUCTURAL DATA (CONT'D)
STRUCTURES WITH PLANNED STORAGE CAPACITY
Nonconnah Creek Watershed, Tennessee and Mississippi
(Continued)

Item	Unit	Nonconnah Lake	Johns Creek Structures			Total
			11	15	17	
			C	C	C	
Size of Conduit	Dim.	8'x10'	48"	30"	54"	-
Emergency Spillway						
Rainfall Volume (ESH) (Areal)	In.	17.20 (4 Day)	12	12	12	-
Runoff Volume (ESH)	In.	13.99	9.45	9.45	9.45	-
Type		Chute	Veg	Veg	Chute	-
Bottom Width	Ft.	500	300	150	300	-
Velocity of Flow (Ve)	Ft./Sec.	-	8.15	5.96	-	-
Slope of Exit Channel	Ft./Ft.	-	0.028	0.033	-	-
Maximum Water Surface Elev.	Ft.	335.0	331.5	344.0	324.7	-
Freeboard						
Rainfall Volume (FH)(Areal)	In.	30.50 (2 Day)	29.90	29.90	29.90	-
Runoff Volume (FH)	In.	28.35	26.93	26.93	26.93	-
Maximum Water Surface Elev.	Ft.	335.0	336.6	348.0	330.1	-
Capacity Equivalents						
Sediment Volume	In.	2.18	2.40	2.52	1.71	-
Retarding Volume	In.	6.34	5.00	6.19	5.33	-
Recreation Volume	In.	2.40	-	-	-	-

54. CHANNEL IMPROVEMENT

Flood storage as described in the previous paragraph will effectively control flooding from the reservoir at mile 19.8 downstream to the Johns Creek Tributary at mile 11.8. In this reach channel improvement will be limited to removal of existing debris and silt accumulation, with no enlargement. From mile 11.8 downstream to mile 0.7 it will be necessary to enlarge the existing channel to prevent damage to existing development. The channel section will be enlarged to 110-foot bottom width from mile 0.7 to the Ten Mile Creek Tributary, mile 9.3, and to 90-foot bottom width from mile 9.3 to the Johns Creek Tributary, mile 11.8.

The channel will be designed and constructed to be compatible with the natural and recreational use of the greenway. The channel will follow the existing alignment. Channel banks will be constructed with 1 on 4 side slopes,except where existing banks are flatter, to permit easier maintenance and access to the water. Channel banks will be sodded and intermittently planted with small species of wild and domestic plants to blend in with greenway development. A minimum of 3 cfs will be released from reservoir storage to provide a natural flowing stream appearance at all times, and eliminate mosquito breeding in stagnant pools.

The proposed channel improvement will have no effect on future traffic flow. It will be necessary to alter seven street and highway bridges and two railroad bridges to accommodate the channel improvement and design flows. Riprap protection will be installed to prevent possible bank erosion at 14 bridge sites, and at approximately 13 locations between bridges. It will be necessary to reserve a minimum 600-foot-wide floodway for overbank flow in combination with the improved channel.

Spoil from the channel enlargement will be placed outside the 600-foot greenway or used to shape up areas where the existing channel has been defaced by borrow operations for land fills. In some reaches, spoil may be used to construct a sight and sound barrier between the greenway and adjacent development. No cost estimates have been made or areas designated for spoil placement outside the greenway, as there are many landowners who have indicated a willingness to permit spoil placement without charge. The channel as recommended will reduce the 100-year flow line below the level of existing land fills.

55. RECREATION

a. <u>Reservoir Development</u>. The multiple purpose structure at mile 19.8 will be developed for water and associated land based recreation by two park facilities. A schematic plan of the lake is shown on Plate 3.

The impoundment will contain 6,905 acre feet of recreation storage to provide a lake with a dependable 1,900 acre surface area. The lake will be suitable for fishing and other recreational development, and will provide a scenic base for the diversified park facilities.

A park on the south side of the lake will occupy approximately 1,500 acres and will provide facilities for lake oriented recreation such as fishing, sailboating, paddle boating, flat bottom boating and canoeing. In addition to the lake oriented opportunities, recreation developments in the state park will include campgrounds, picnic sites, game fields, trails, and a group camp.

A park on the north side of the lake will occupy about 120 acres. This will be primarily a day use facility to serve needs of the more immediate local area. Picnic areas, game fields, and boat launching facilities will comprise the major developments.

b. Greenway Development. As a part of the flood control system, it will be necessary to limit development within a 600 foot wide area along Nonconnah Creek to provide for overbank flows during periods of heavy runoff as described in paragraph f. Encroachment into the floodway will restrict flow and reduce the effectiveness of the flood control system. Overbank flow will occur on the average of once every 10 years.

In view of the need for limited use of the lands, and the needs for open space, recreation lands, and nature areas, the recommended plan includes development of the floodway for greenway use to meet these needs. The greenway will be generally 600 feet in width, and will extend from the mouth of Nonconnah Creek to the proposed parks at Nonconnah Reservoir, mile 19.8. Wherever possible, existing vegetation within this area will be left in place to preserve a natural setting. A system of hiking, bicycle, and horseback trails will be included to extend the full length of the greenway. The trails will pass underneath streets and highways on channel berms underneath existing bridges. Tributary channels entering Nonconnah Creek will be crossed by fording or small low water foot bridges.

In some areas the vegetation has been cleared from the greenway area and the lands have been used as borrow area for land fill operations. In these reaches, borrow pit banks will be reshaped to a pleasing appearance, and replanted to combinations of domestic and wild plant species. At selected points such as roadway intersections, the greenways may be enlarged to include picnic areas, game fields, and will contain rest areas. The greenway development will attract recreation facility users into the project area, but the facilities will be distributed along a distance of about 20 miles, and there will be no significant effect on traffic at any point.

56. FISH AND WILDLIFE DEVELOPMENT

All lakes created by flood control structures will be stocked with fish and maintained through cooperation with the U. S. Fish and Wildlife Service and the Tennessee Game and Fish Commission.

Due to the urbanizing nature of the project and surrounding lands, there is little opportunity to preserve or enhance wildlife habitat for game hunting. Woodlands preserved in greenway areas and reestablished in park facilities will preserve habitat for small animals and enhance the esthetic quality of these resources.

SECTION XIII - COST ESTIMATES

57. BASIS OF FEDERAL AND LOCAL COST SHARING

The recommended plan of improvement involves a joint effort of the Department of Agriculture and the Corps of Engineers working closely with local sponsors. Project features of each agency will require local contributions towards the costs. The following paragraphs outline the recommended policies for sharing installation costs between the Federal Government and local sponsors.

a. Land Treatment Measures. The land treatment measures will be voluntarily installed by the landowners and operators. Costs involved in the application of land treatment measures, other than those borne by Federal funds, will be provided by the landowners and operators. Technical assistance necessary to accelerate the installation of these measures will be provided by Federal funds through the Soil Conservation Service. All critical area treatment, except critical area tree planting, will be installed by division of work. The rate of assistance from Federal funds will not exceed that for similar measures under other current assistance programs in Tennessee. The critical area tree planting will be cost-shared 75 percent Federal funds and 25 percent other funds. This is the maximum cost-sharing ratio for similar measures under other current assistance programs in Tennessee.

Since a major purpose of this project is the conservation and proper utilization of land, the Soil Conservation Service and Forest Service as Agents of the Secretary of Agriculture, may enter into long-term agreements with landowners, operators, and occupiers. These contracts will be based on conservation plans developed in cooperation with, and approved by, the Soil Conservation District where the land is located. The contracts will provide for land-use adjustments based on the Soil Capability System, to conserve and develop the soil, water, forest land, wildlife, and recreation resources of lands within the Basin.

Applications for technical assistance in developing conservation plans and cost-sharing the installation of such plans and practices that are needed shall be made to the Soil Conservation District. The Soil Conservation Service, when approval is granted by the Soil Conservation District, shall agree to share the cost of carrying out the conservation plan for practices and measures which are appropriate and in the public interest. The portion of such costs, including labor, to be cost-shared shall not exceed the rate of assistance for similar practices and measures under existing National programs. Federal cost-sharing is estimated to be at the rate of 50 percent for non-critical area measures, and 75 percent for critical area practices, except critical area roadside plantings which are based on 50 percent cost-sharing.

b. Floodwater Retarding Structures on Johns Creek. Federal funds will be used to pay all construction costs and land rights costs including costs for land rights obtained in fee title. Engineering and project administration costs actually incurred by United States Department of Agriculture will also be a Federal responsibility. Relocation payments will be cost-shared. The sponsoring local organization will be responsible for project administration costs that it incurs, which include costs for land acquisition prior to actual expenditure for title to the land. The sponsors will assume operation and maintenance responsibilities. Federal financial assistance will be provided under appropriate agreements executed by the sponsors and the Soil Conservation Service.

c. Reservoir on Main Channel of Nonconnah Creek. Federal Policy concerning the requirements of local cooperation for flood control storage is stated in Section 201 of the 1958 Flood Control Act (Public Law 85-500) which, in effect, provides that, in accordance with Section 2 of the 1938 Flood Control Act, no local cooperation is required for reservoirs solely for flood control.

The concept of Federal responsibility embodied in legislative enactments over the years, and policy established through authorization of specific projects provides that the general policy of Federal responsibility be applied when no definite basis exists for deviation from the general policy of full Federal assumption of costs for reservoirs. Deviation from general policy has been limited to situations where reservoir storage serves in lieu of other types of feasible local protection measures, or benefits of sufficient magnitude to justify the project are concentrated in one locality or would accrue to readily identifiable developments in a continuous damage reach or problem area. No deviation from general policy is normally recommended where application of normal requirements for local protection projects would effect an inordinately high local contribution.

The flood control storage in reservoirs in the recommended plan comprise a necessary and integral part of a complex plan of regional flood control within the Nonconnah Basin. No other type of local protection is engineeringly and economically feasible.

The reservoir storage provides flood control for runoff from Desoto and Marshall counties in Mississippi, Shelby and Fayette counties in Tennessee, and in combination with other project features provides for control of runoff or flooding from the incorporated cities of Collierville, Germantown, and Memphis, Tennessee, and several unincorporated communities.

In the Nonconnah Basin, benefits will accrue to more than 3,000 individual residences, commercial, and business establishments. Beneficiaries are not readily identifiable, and many are national corporations with economic influence throughout the United States. Approximately 13,800 inhabitants of the Nonconnah floodplain will directly benefit from flood control features, as will several thousand other people who are employed by or frequently use commercial and industrial facilities within the floodplain.

In view of the regional effect of flood control storage no diviation from general policy of Federal responsibility for flood control storage in the Nonconnah Basin is appropriate. In accordance with general policy, all costs associated with providing flood control storage will be a Federal responsibility.

The recommended plan includes storage for recreation uses. Costs associated with recreation storage will be shared 50 percent Federal and 50 percent by local sponsors. The final percentage of the total cost of the reservoir on the main channel of Nonconnah Creek to be a responsibility of local sponsors was developed by comparing estimated costs of the recommended reservoir with and without the recreation storage.

d. Channel Improvement. Excavation costs will be Federal responsibility. Local sponsors will be responsible for all relocations (utilities, highway and street alterations and protection works) except railroads. Railroad relocations will be accomplished at Federal expense. The channel improvement will be within the proposed 600-foot greenway. Local sponsors will be responsible for cost of lands specifically necessary for the channel improvement construction. Cost-sharing policy on remaining greenway lands is described in paragraph g below.

e. Recreation Facilities in Reservoir Development. Recreation development costs will be shared 50 percent Federal and 50 percent local sponsors responsibility, including the cost of lands. Federal responsibility will be 50 percent of all general recreation facilities normally associated with water-based recreation including the cost of lands and will not include revenue producing facilities for such uses as the retail sale of sports equipment, or facilities installed specifically for convenience in operation and maintenance.

f. Greenway Development. Recreation facilities to be installed in the proposed greenway will be cost-shared 50 percent Federal and 50 percent local. The land cost for the 600-foot greenway will be shared by Federal and local sponsors.

g. Greenway Land Costs. The final percentage of total land cost to be a responsibility of local sponsors was developed by comparing the estimated costs of lands specifically necessary for channel improvement, plus 50 percent of the remaining lands, to total land costs.

58. INSTALLATION COSTS

a. Department of Agriculture Features. The total estimated installation costs of the features to be installed with Department of Agriculture assistance is $9,879,000, of which $8,356,450, or about 84.6 percent will be Federal funds and $1,522,550, or about 15.4 percent will be other funds. These estimates represent all of the direct and indirect cost items to install the project measures such as land, labor, materials, machinery, etc.

(1) The land treatment measures have an estimated installation cost of $2,390,000, including $1,370,450 in Federal funds and $1,019,550 in other funds. The distribution of the critical area land treatment costs follow:

	Estimated Costs	
Item	Federal Funds	Other Funds
Critical area vegetative	$119,700	$39,900
Roadside	40,600	40,600
Debris basins	23,600	7,900
Tree planting	25,800	8,700
Technicial assistance	60,850	0

The critical area vegetative planting, roadside stabilization, and debris basins will be installed by a division of work. The cost of technical assistance to be furnished from Federal funds by the Soil Conservation Service is $56,600 and the U.S. Forest Service is $4,250. This assistance will be provided for planning and applying the critical area treatment measures.

It is estimated that 15,600 acres of cropland and 7,750 acres of grassland will be treated for erosion control at a cost of $1,300,100 of which $650,050 will be Federal funds. Land treatment measures include installation of complete conservation cropping systems as determined by the individual landowner during the development of approximately 125 resource conservation plans. Planned practices include terraces, grassed waterways, minimum tillage, diversions and contour farming. Approximately 4,280 acres will have erosion control measures applied during the urbanizing process at a cost of $179,800 of which $89,900 will be Federal cost. Such measures will include debris basins, sediment traps and buffer strips.

The costs of installation of the forestry phases of the private land treatment program were developed by the U.S. Forest Service and Tennessee Division of Forestry. The technical assistance costs were based upon the present cost of similar practices of the going Cooperative Forest Management Program. Installation costs were based on present prices being paid by landowners to establish similar measures in the area. The forest land treatment measures were developed from the field survey of the watershed and were adjusted for expected landowner participation during the installation period.

The estimated cost of the forest land treatment program is $284,500. Of this amount, $164,300 is Federal funds and $120,200 is from other sources.

The U.S. Forest Service, by and through the Tennessee Division of Forestry and Mississippi Forestry Commission, will provide $9,300 for accelerated technical assistance. The going Cooperative Forest Management Program will provide additional technical assistance valued at $800.

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(2) The estimated installation cost of the three single-purpose floodwater-retarding structures for flood prevention is $7,489,000. The cost to be borne by Federal funds for construction and engineering services and relocation payments is $1,228,500. The estimated construction cost of $974,800 includes 25 percent for contingencies. Estimated cost for engineering services is $243,700 which includes the direct cost of engineers and other technicians for surveys, investigations, design, and preparation of plans and specifications for structural measures, including the vegetation. The cost of engineering services does not include similar services for land rights. The installation cost to be borne by Federal funds is estimated to be $5,461,500 for land rights and relocation payments. Included in the land rights costs are the modification or alteration of 6,800 feet of roads, three bridges, 2,000 feet of railroad track and one railroad bridge, and modification of one TVA 500 KVA transmission line tower at a cost of $45,000, and providing access to two additional TVA towers.

The Chickasaw Basin Authority will bear the costs incurred in serving notice of displacement, providing appropriate application forms, assisting in filing applications, hearing and resolving grievances, and in making relocation payments. The Soil Conservation Service will bear the costs they incur for assisting the Chickasaw Basin Authority in providing these services.

Other funds will be used to provide for contract administration, legal fees, court hearings, land acquisitions, and other general administration costs of the sponsors. The sponsoring local organizations will provide without Federal cost-sharing, the engineering,

legal, and administrative costs incurred for acquiring land rights. The sponsors, will at their own option and without Federal cost-sharing, inspect the installation or any portion of work of improvement.

Estimated installation costs of Department of Agriculture features are presented in Table 10. Costs of land rights were based on 1972 current sales of land in the area near the structures. Land treatment costs were based on prices paid by landowners. Technical assistance costs were based on present costs of the going SCS and CFM Programs.

b. Corps of Engineers Features. Estimated installation costs of structural features to be installed by the Corps of Engineers are based on recent contracts for similar work in this area. An analysis of the real estate market as represented by sales of lands in the study areas was used as the basis for determining right-of-way costs. Detailed estimates are presented in Appendix B and are based on price levels for September 1972. The estimated first costs, including allowances for contingencies, are summariezed in Table 11.

Allocation of costs among the multiple-purpose project features to be constructed by the Corps of Engineers was made by estimating separable costs of each function. Table 12 below summarizes the cost allocation, shows percentage of project feature costs to be non-Federal responsibility, and estimated total non-Federal costs.

Multiple-purpose features include the Nonconnah Reservoir, which will contain storage for flood control and recreation, and the greenway lands, which will be used for flood control and recreation improvements. Actual channel enlargement, park facilities, and greenway development are single-purpose features, and will be cost shared according to Federal policy for flood control and recreation features. Detailed information on computation of separable costs is contained in Appendix B.

59. ANNUAL CHARGES

a. General. The estimated average annual charges attributed to the structural work and recreation development in the recommended plan are based on an evaluation period of 100 years and an interest rate of 5-5/8 percent.

b. Johns Creek Structures. Annual charges for the three structures on Johns Creek were computed to be $432,100 annually. The breakdown of annual costs for these structures is presented in Table 13.

c. Features on Main Channel Nonconnah Creek. A breakdown of annual charges on work to be performed by the Corps of Engineers is shown on Table 13. Operations and maintenance cost include allowances for major replacement.

60. COST SUMMARY

The estimated cost of installation for all project features to be carried out with the assistance of the U.S. Department of Agriculture and the Corps of Engineers is summarized in Table 14.

TABLE 10 - ESTIMATED INSTALLATION COST FOR
DEPARTMENT OF AGRICULTURE FEATURES
Nonconnah Creek Basin
Tennessee and Mississippi

Installation Cost Item	Unit	Number Non-Fed. Land	Estimated Cost (Dollars) 1/ Fed. Funds Non-Fed.Land	Other Funds Non-Fed.Land	Total
LAND TREATMENT					
Soil Conservation Serv.					
Cropland	Acre	15,600	421,200	421,200	842,400
Grassland	Acre	7,750	228,850	228,850	457,700
Urban & Builtup	Acre	4,280	89,900	89,900	179,800
Critical Area Veg. Planting	Acre	1,330	119,700	39,900	159,600
Critical Area Roadside Planting	Acre	250	40,600	40,600	81,200
Debris Basins	No.	35	23,600	7,900	31,500
Technical Assistance	XXXX		282,300	71,000	353,300
SCS-Subtotal		29,210	1,206,150	899,300	2,105,500
Forest Service					
Forest Land	Acre	5,200	101,400	101,400	202,800
Critical Area Tree Planting	Acre	600	25,800	8,700	34,500
Technical Assistance	XXXX		37,100	10,100	47,200
FS-Subtotal		5,800	164,300	120,200	284,500
TOTAL-LAND TREATMENT		35,010	1,370,450	1,019,550	2,390,000
STRUCTURAL MEASURES					
Construction					
Floodwater-Retarding Strs.	No.	3	974,800	-	974,800
Subtotal-Construction			974,800	-	974,800
Engineering Services	XXXX		243,700	-	243,700
Relocation Payments	XXXX		10,000	2,000	12,000
Project Administration					
Construction Inspection	XXXX		125,000	-	125,000
Other			181,000	500,000	681,000
Relocation Assistance Advisory Services			-	1,000	1,000
Subtotal-Administration			306,000	501,000	807,000
Other Costs					
Land Rights	XXXX		5,451,500	0	5,451,500
Subtotal-Other Costs			5,451,500	0	5,451,300
TOTAL-STRUCTURAL MEASURES			6,986,000	503,000	7,489,000
TOTAL PROJECT			8,356,450	1,522,550	9,879,000
SUMMARY					
Total - SCS			8,192,150	1,402,350	9,594,500
Total - FS			164,300	120,200	284,500
TOTAL PROJECT			8,356,450	1,522,550	9,879,000

1/ Price base - 1972.

TABLE 11
FIRST COSTS CORPS OF ENGINEERS
PROJECT FEATURES

	Federal Cost $	Non-Federal Cost $	Total Cost $
CORPS OF ENGINEERS			
Nonconnah Reservoir			
Flood Control Storage	24,663,000		24,663,000
Recreation Storage	1,300,000	1,300,000	2,600,000
Subtotal	25,963,000	1,300,000	27,263,000
North Park	988,000	988,000	1,976,000
South Park	3,246,500	3,246,500	6,493,000
Channel & Greenway			
Land Costs	2,625,000	8,105,000	10,730,000
Channel Improvement	8,306,500	908,500	9,215,000
Recreation Facilities (Miss River to Reservoir)	386,000	386,000	772,000
Subtotal	11,317,500	9,399,500	20,717,000
TOTAL	41,515,000	14,934,000	56,449,000

Price Base 1972

TABLE 12

ESTIMATED COST DISTRIBUTION - CORPS OF ENGINEERS FEATURES

	Separable First Cost $	Percent Non-Federal Cost	Estimated Non-Federal Cost $
Multiple Purpose Features			
Nonconnah Reservoir			
Flood Control	24,663,000	0	0
Recreation Storage	2,600,000	50	1,300,000
Total	27,263,000	5	1,300,000
Greenway Lands			
Flood Control rights-of-way	5,480,000	100	5,480,000
Lands to be developed for recreation	5,250,000	50	2,625,000
Total	10,730,000	75	8,105,000
Single Purpose Features			
South Park	6,493,000	50	3,246,500
North Park	1,986,000	50	988,000
Greenway Development	722,000	50	386,000
Channel Improvement	Not Applicable	Not Applicable	908,500
TOTAL ESTIMATED NON-FEDERAL COST			14,934,000

TABLE 13

ANNUAL COSTS OF PROJECT FEATURES

Project Features	First Cost	Federal Costs			Non-Federal Costs			Total Annual Charge
		Interest	Amortization	Operation & Maintenance	Interest	Amortization	Operation & Maintenance	
	$	$	$	$	$	$	$	$
Nonconnah Reservoir	27,263,000	1,460,400	6,200	150,000	73,100	300	0	1,690,000
North Park	1,976,000	55,600	200	0	55,600	200	20,000	131,600
South Park	6,493,000	182,600	800	0	182,600	800	120,000	486,800
Channel Improvement	9,215,000	467,200	2,000	0	51,100	200	416,000	936,500
Greenway Lands	10,730,000	147,700	600	0	455,900	1,900	0	606,100
Greenway Development	772,000	21,700	100	0	21,700	100	80,000	123,600
Johns Creek Structures	7,489,000	393,000	1,700	0	28,300	100	9,000	432,100
TOTAL	63,938,000	2,728,200	11,600	150,000	868,300	3,600	645,000	4,406,700

1972 Price Base

TABLE 14
SUMMARY OF FIRST COSTS
Nonconnah Creek Watershed, Mississippi and Tennessee

	Federal Cost	Other Cost	Total
U. S. DEPARTMENT OF AGRICULTURE			
Land Treatment			
SCS	1,206,150	899,300	2,105,500
FS	164,300	120,200	284,500
Subtotal	1,370,450	1,019,550	2,390,000
Johns Creek Structures	6,986,000	503,000	7,489,000
TOTAL - USDA	8,356,450	1,522,550	9,879,000
CORPS OF ENGINEERS			
Nonconnah Reservoir	25,963,000	1,300,000	27,263,000
North Park	988,000	988,000	1,976,000
South Park	3,246,500	3,246,500	6,493,000
Channel & Greenway	11,317,600	9,399,500	20,717,000
TOTAL - CORPS OF ENGINEERS	41,515,000	14,934,000	56,449,000
TOTAL - COMBINED PROJECT	49,871,450	16,456,550	66,328,000

1972 Price Level

SECTION XIV - BENEFITS FROM WORKS OF IMPROVEMENT

61. GENERAL

Benefits which will accrue as a result of the project were determined according to the procedures presented in Appendices C and F.

62. FLOOD CONTROL

The construction of four reservoirs, preservation of a 600-foot floodway and the recommended channel improvement will reduce both the magnitude and frequency of flood damage on the Johns Creek and Nonconnah Creek floodplains.

The recommended works of improvement will effectively eliminate major damage from floods of 100-year return frequency and all lesser floods in the Nonconnah and Johns Creek floodplains, and would significantly reduce damages from floods larger than the 100 year frequency. The project will permit urbanization of lands outside the 600-foot greenway without increasing potential flood losses on existing development.

Table 15 below shows estimated damage reduction benefits for the Johns Creek and main stem Nonconnah floodplains.

TABLE 15
SUMMARY OF ANNUAL FLOOD CONTROL BENEFITS
NONCONNAH BASIN PROJECT

	Economic & Hydrologic Condition			Base Year Plus Discounted Future Values
	Existing (1970-71)	Base Year (1980)	Future (2000)	
	$	$	$	$
Damage without project	1,213,600	3,537,500	5,773,600	4,931,300
Damage with project	3,200	11,500	63,200	43,700
Damage reduction benefits (1-2)	1,210,400	3,526,000	5,710,400	4,887,600

Price level: 1972

The damages remaining with project conditions are average annual losses which may result from storms larger than project design, and isolated developments in low areas which may be subject to minor damage after projects are installed. Flood insurance will be available under a separate Federal program to protect homeowners from catastrophic loss from any damage which may be incurred after projects are completed.

63. WATERSHED PROTECTION

The application of conservation measures on 35,010 acres including the stabilization of 2,180 acres of critically eroding uplands and road-banks will benefit private landowners and the general public. The soil resource base will be preserved, and the environmental conditions will be improved. The treatment of critically eroding uplands, beyond the normal economic capabilities of individual landowners, will accrue to the national interest and to the public as a reduction in net loss of agricultural potential, and to the farmer as an increase in net income. Benefits will also accrue in reduced costs of construction, operation and maintenance of the structural works of improvement. The quality of the surface water resource will be significantly improved by reduction of suspended sediment, although, suspended sediment will continue to affect, to a lesser degree, the surface water quality.

64. RECREATION

The reservoir development, with recreation storage to provide a suitable lake for water-based recreation, in combination with the proposed park developments will benefit the entire Memphis, West Tennessee and Mid-South area by providing a wide range of recreation activity. The recreation value of the reservoir and associated park development will be $1,250,000 annually. The North Park will provide benefits of $350,000 based on use of 350,000 visitor-days annually, and the South Park will provide benefits of $900,000 based on 600,000 visitor-days annually.

Development of the 600-foot floodway from the Mississippi River to the proposed reservoir will complement the reservoir park development, and provide recreation opportunity within the Memphis Urban Area. The greenway would provide a connection between the existing McKellar State Park near the mouth of Nonconnah Creek and the proposed reservoir development.

The recreation value of the greenway is estimated at $500,000 annually based on 500,000 visitor-days. Monetary benefits due to enhancement of environmental and esthetic values in the urban area were not estimated, but these would be significant. Total recreation benefits from the recommended plan are estimated at $1,750,000 annually.

65. AVERAGE ANNUAL BENEFITS AND COSTS OF STRUCTURAL MEASURES

Table 16 below shows average annual benefits and costs of structural measures for recommended plan of improvement.

TABLE 16
AVERAGE ANNUAL BENEFITS AND COSTS OF STRUCTURAL MEASURES

Flood Damages Prevented	Recreation Benefits	Total Annual Benefits	Annual Cost	Benefit-Cost Ratio
$	$	$	$	
4,887,600	1,750,000	6,637,600	4,407,000	1.5

SECTION XV - SOCIAL ASSESSMENT

66. SOCIAL ASSESSMENT

a. General. Nonconnah Creek has a significant effect on social attitudes in the surrounding area. Approximately one-half of the population of the city of Memphis is within the Nonconnah drainage area. Many view the Nonconnah Creek as a place of opportunity to develop needed recreation and open space for the urbanizing area; others would prefer use of all available land for urban development. Lands adjacent to Nonconnah Creek are being rapidly developed, often within floodplain areas. Lands in upstream areas outside the city of Memphis are developing as high value residential homesites in subdivisions and semi-rural character. There are unquestionable needs for recreation developments to serve the expanding urban population. There are some who question the feasibility of developing these facilities in conjunction with flood control works on Nonconnah Creek.

General social attitudes without project development will not likely change over time, except as a result of major flooding. There will be increased need for recreation and open space as the population increases. There will continue to be many who would demand development of these facilities in appropriate areas until the opportunity for such development is lost, and others for personal or other reasons will prefer use of resources for other purposes.

The recommended plan will provide many real and significant environmental and secondary benefits. Monetary values of these benefits were not estimated, but these will be realized by an estimated 300,000 citizens within the basin area, as well as people living in adjacent areas.

b. Community Impact. Construction of the Nonconnah Lake and associated development will have significant impacts on the surrounding community and social attitudes. Lands in the vicinity of the lake for several years have been developing as high-value residential areas of suburban and semi-rural estate type developments. Construction of the lake and associated park developments may contribute to acceleration of this trend, or because of high density use and an influx of lower income families participating in recreational opportunities there may be a lowering of property values and social preferences of the area.

There are many citizens who fear that the recommended project will disrupt the continued growth of the community. There are others who feel that a lake development will stimulate growth, and would be much preferred over alternate projects such as enlarged or paved channels for esthetic reasons.

c. Noise and Air Pollution. Construction or operation of the proposed project is not expected to have any significant adverse effect on noise or air pollution in the area. There may be some noise generation during project construction, but this will be no more intense than noise generated by continuing urban development in the project area.

Air pollution levels are generally light in the Nonconnah Creek Basin, and will not be affected by the proposed project. Neither of these characteristics will adversely affect the operation of proposed project features for flood control or recreation use. The open space and conservation of natural areas afforded by the project should have some beneficial effect in reduction of noise and air pollution concentration following project construction.

Traffic noise will be a factor in recreational value of the Nonconnah Greenway below Mt. Moriah Road. In this reach the greenway runs parallel to Interstate 240 and passes near the Memphis International Airport. Noise levels from the interstate highway may be reduced in some reaches by strategic spoil placement in some reaches to sound noise barriers, but little can be done to offset noise from aircraft. Noise is not expected to be a factor above Mt. Moriah Road on the greenway, or at the Nonconnah Reservoir site.

SECTION XVI - INTERAGENCY COORDINATION

67. GENERAL

The recommended plan of improvement has been jointly developed by the Corps of Engineers and Department of Agriculture, in cooperation with local sponsors. Pertinent correspondence expressing views and inputs to the study and response to a review of a draft of this report are included in Appendix G.

68. BUREAU OF SPORT FISHERIES AND WILDLIFE

The U.S. Fish and Wildlife Service forwarded a report dated 6 October 1972, stating that the proposed plan will improve opportunities for sport fishing and wildlife oriented recreation. The Fish and Wildlife Report made several recommendations for modification of the project in the interest of Fish and Wildlife which have been included in the recommended plan.

One recommendation of the Fish and Wildlife Service which is not included in the recommended plan would provide for seasonal fluctuation of the permanent pool elevation in the Nonconnah Lake. Seasonal fluctuation is not recommended because such operations would not be compatable with regulations of the Tennessee Department of Public Health, which require a constant minimum depth for mosquito control.

A copy of the Fish and Wildlife Report dated 6 October 1972, with inclosures stating concurrence of the Tennessee Game and Fish Commission and comments of the Division of State Parks, Tennessee Department of Conservation, is included in Appendix G.

Also included in Appendix G are letters dated 5 June 1973 and 2 July 1973, confirming Fish and Wildlife Service comments after a review of a draft of this report.

69. BUREAU OF OUTDOOR RECREATION

Following a review of a draft of this report, the Federal Bureau of Outdoor Recreation forwarded a report to the Memphis District Engineer dated 1 June 1973.

A copy of the BOR report is included in Appendix G. The Bureau of Outdoor Recreation viewed the recommended plan as most appropriate of those considered to meet combined needs of flood control and recreation.

The BOR report recommends purchase of a minimum strip of land 300 feet in width around the perimeter of the Nonconnah Reservoir. The recommended plan and cost estimates as presented in the report anticipates purchase of a minimum of 300 feet around the perimeter of the Nonconnah Reservoir as recommended by BOR.

70. NATIONAL PARK SERVICE

A copy of a draft of this report was forwarded to the National Park Service on 18 April 1973, with request for comments by 1 June 1973. No comments were received.

71. ENVIRONMENTAL PROTECTION AGENCY

Nonconnah Creek investigations were coordinated with the Environmental Protection Agency throughout the study to determine effects of reservoir storage and channel enlargement on water quality. Input from EPA has been incorporated into this report.

72. U.S. GEOLOGICAL SURVEY

Nonconnah Creek investigations were coordinated with the U.S. Geological Survey to determine project effects on mining and mineral resources in the basin, and on water supply aquifers.

73. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

A copy of a draft of this report was forwarded to the Department of Health, Education, and Welfare on 18 April 1973, with request for comments by 1 June 1973. No comments were received.

74. STATE OF TENNESSEE OFFICE OF URBAN AND FEDERAL AFFAIRS

The Nonconnah Creek investigations were closely coordinated with the state of Tennessee through the Department of Urban and Federal Affairs. The Tennessee Department of Conservation participated in the development of the recommended project. The plan for the South Park as recommended on the Nonconnah Lake in this report was originally developed by the Tennessee Conservation Department as a proposal for development and operation under the Tennessee State Parks System.

Following a review of a draft of this report, the Governor forwarded a letter dated 6 July 1973, to the District Engineer and State Conservationist stating that he had decided, upon advice of his staff, not to construct or operate the South Park on the proposed Nonconnah Lake as a state park. The letter also

raised several questions on other project features. On 23 July 1973, representatives of the Corps of Engineers and Soil Conservation Service met with representatives of the State, and on 30 July 1973, the Memphis District Engineer and the State Conservationist met with the Governor to discuss the points of concern. A copy of the Governor's letter dated 6 July 1973, and memorandums prepared as a record of the subsequent meetings are included in Appendix G.

75. MISSISSIPPI-ARKANSAS-TENNESSEE COUNCIL OF GOVERNMENTS

A copy of a letter dated 24 August 1972, from the Mississippi-Arkansas-Tennessee Council of Governments to the Chickasaw Basin Authority stating views of the MATCOG Executive Committee on the Nonconnah Project is included in Appendix G. Letters from the Shelby County Engineer and the Environmental Action Council of Memphis are included as attachments to the letter from MATCOG.

76. CHICKASAW BASIN AUTHORITY

Close and continuous coordination was effected with the Chickasaw Basin Authority throughout the study and preparation of this report.

The Authority consists of representatives of State and local governments and is fully empowered to provide necessary local participation in project features recommended in this report. A letter from the Authority dated 14 September 1973, stating intent to provide local requirements is included in Appendix G.

77. MEMPHIS AND SHELBY COUNTY PLANNING COMMISSION

In 1968, the Memphis and Shelby County Planning Commission completed a comprehensive plan for the Memphis metropolitan area. The comprehensive plan is published in many separate reports, covering all phases of the urban development such as land use, recreation, environmental, institutional, cultural, transportation, and community services. The reports include projections of needs and planned development through 1990.

The investigation studies made in preparation of this report were coordinated with the Planning Commission to insure that recommended projects are consistent with the Comprehensive Plan.

A letter from the Memphis and Shelby County Planning Commission dated 30 May 1973, is included in Appendix G. The letter states that the recommended project is consistent with the Planning Commission's Parks, Recreation, and Conservation Plan.

78. CITY OF MEMPHIS

Studies have been fully coordinated with the city of Memphis. A letter from the Mayor of Memphis dated 17 October 1973, is included in Appendix G of this report. In that letter, the Mayor expresses full support of the recommended project.

Following reviews of a draft of this report, the Memphis City Engineer forwarded comments to the Memphis District Engineer in a letter dated 27 August 1973. The City Engineer expressed general agreement with the recommendations contained in the report, particularly the essentiality of the recommended dams, and made several comments concerning the recommended channel enlargement. Comments of the City Engineer have been incorporated into this report. The City Engineer also requested consideration of a channel design below Johns Creek that would include a concrete bottom section and vegetated side slopes not exceeding 1 on 12, to reduce future maintenance.

The channel design as requested has been considered and is described in this report as Plan No. 7. The channel design as described in Plan No. 7 would result in a significant reduction in future channel maintenance costs, but because of substantially higher construction costs, as compared to the recommended plan, is not justified by comparison of total annual costs and benefits.

Channel maintenance costs for channel enlargement below Johns Creek as presented in this report were developed in cooperation with the office of the City Engineer.

79. SHELBY COUNTY

The studies have been coordinated with the governing body of Shelby County. A letter dated 23 October 1973, from the Shelby County Court with resolution in support of the recommended plan is included in Appendix G of this report.

Studies were coordinated with the Shelby County Health Department to determine the sources and extent of stream pollution, existing and future water quality standards, and effects of project features on water quality.

A copy of a draft of this report was forwarded to the Shelby County Health Department on 18 April 1973, with request for any comment on project recommendation by 1 June 1973. No comments were received.

80. LOCAL COOPERATION FOR INSTALLATION OF LAND TREATMENT AND JOHNS CREEK STRUCTURES

The features of the recommended plan to be carried out with the assistance of the United States Department of Agriculture are conservation land treatment and three structures for flood control on Johns Creek. The actual sequence of construction will depend on: (1) meeting the requirement of at least 75 percent effective critical area stabilization; (2) agreements from landowners to carry out recommended soil and water conservation measures on 50 percent of the land above the floodwater-control structures on the Johns Creek drainage area, and (3) order of obtaining land rights.

Emphasis will be placed on treatment of critically eroding land areas during the first two project years. About three years is the estimated time required to obtain land rights and to complete construction of the Johns Creek structures if funds are available. Land treatment and structure installation activities can be concurrent.

Land treatment measures will be voluntarily planned and applied by the landowners in cooperation with the going and accelerated program of the Shelby County Soil Conservation District, Tennessee, and Marshall and DeSoto Counties, Mississippi, Soil and Water Conservation Districts. The Soil Conservation Service will provide technical assistance for the preparation and application of conservation plans and will accelerate, from Federal funds, the technical assistance to the going district conservation programs.

The Shelby, Marshall, and DeSoto County Soil Conservation Districts will obtain agreements from landowners and operators to carry out conservation plans on not less than 50 percent of the land in the drainage area of each floodwater-control structure on the Johns Creek tributary. These agreements will be obtained before Federal funds are provided for construction of the dams.

The Soil Conservation Service will furnish technical assistance to landowners, developers, planning groups, and others for the planning and installation of land treatment practices other than forestry. The Tennessee Division of Forestry and the Mississippi Forestry Commission, in cooperation with the U. S. Forest Service, will furnish similar assistance / ~~determining~~ and planning ~~the most~~ effective forestry practices. ~~land treatment for forest land~~. Landowners and developers will be urged to apply and maintain accepted forestry measures on forested lands.

The U. S. Forest Service, by and through the Tennessee Division of Forestry and the Mississippi Forestry Commission, will provide the technical assistance necessary to accelerate the timely installation of forestry practices. This assistance is over and above that assistance already provided to the landowner under the going Cooperative Forest Management Program. A forester well-grounded in watershed and recreation management will help guide and assist the landowners and the concerned state, county, and municipal planners ~~when necessary~~.

The Chickasaw Basin Authority in cooperation with soil conservation districts and local highway departments will be responsible for installing measures to stabilize or control high runoff and sediment-producing critical areas. All critical area land treatment except tree planting will be installed on a division-of-work basis. The sponsors plan to perform their share of the installation work with contributed labor, equipment, and materials in lieu of providing cash.

The Soil Conservation Service will provide technical assistance to the sponsors to apply the critical area vegetative and roadside plantings and debris basins. Federal funds to install the critical area vegetative plantings will be used to furnish, as needed, heavy equipment hire (such as bulldozers for shaping), and planting materials to include seed, fertilizer, lime (including spreading), mulch, and other similar materials (including delivery to central locations within the watershed). The Chickasaw Basin Authority, in cooperation with the Soil Conservation Districts, will provide all other items required to prepare an adequate seedbed and to establish vegetation which includes, but is not limited to, labor, farm tractors, machinery, and transportation of materials within the watershed.

Federal funds for installation of critical roadside plantings will be used to furnish, as needed, materials to include bermuda grass sprigs, chunks, seed, fertilizer, lime (including spreading), and other suitable vegetative materials (including delivery to central locations within the watershed). The Chickasaw Basin Authority, in cooperation with local highway departments, will furnish, as needed, equipment or equipment hire (bulldozers) for sloping roadbanks and all other items required to prepare an adequate seedbed and to establish the vegetation including but not limited to labor, farm equipment, machinery, and transportation of materials within the watershed.

Federal funds to install debris basins (gully plugs) will be used to hire heavy equipment (bulldozers). The Chickasaw Basin Authority will furnish materials including but not limited to seed, fertilizer, mulch, and other items such as labor, farm equipment, and transportation of materials for establishing vegetation on the embankment and emergency spillways of debris basins and other areas disturbed during construction. The Chickasaw Basin Authority will also furnish, where needed, corrugated metal conduit pipe and collars for construction of a principal spillway. Federal funds will be used to install the pipe and to furnish other materials such as fittings and blocks.

The critical area tree planting will be installed by the Chickasaw Basin Authority. The Authority will enter into an agreement with the U. S. Forest Service to install the critical area tree planting on private land. This agreement will designate the responsibilities for installing the plantings. Methods agreeable to the Chickasaw Basin Authority and U. S. Forest Service will be used to accomplish the tree plantings. Site preparation and fencing will be used as needed to assure the success of tree planting. The U. S. Forest Service will provide technical assistance from Federal funds to apply the critical area tree plantings.

Prior to providing financial assistance from Federal funds for the construction of any planned structural measure, at least 75 percent of the effective land treatment measures must be installed or their installation commenced on those sediment source areas which, if left uncontrolled, would require a material increase in the cost of construction, operation, and maintenance of the structural works of improvement.

The Engineering Department of the City of Memphis and Shelby County and the Memphis and Shelby County Planning Commission are at present studying ways to strengthen existing regulations governing erosion controls and within their legal authority will develop conservation land use plans, policies, and guidelines for the urbanizing areas.

The Chickasaw Basin Authority will have the primary responsibility for installing the proposed works of improvement. The Authority was created by an Act of the Tennessee State Legislature as an entity of state government, and includes the drainage areas within Tennessee of Nonconnah Creek, Wolf River, and the Loosahatchie River. Powers of the Authority allow it to contract or make agreements with government bodies including the state of Mississippi, and with private individuals and corporations; adopt bylaws; employ administrator and staff; sue and be sued. The Authority is empowered to acquire land and facilities needed for works of improvement, but the exercise of the power of eminent domain is reserved to cities and counties within the basin.

The Authority will be responsible for installing the single-purpose flood prevention structures on Johns Creek. The Authority will obtain all needed land rights that may be obtained by agreement with landowners. Shelby County, Tennessee will exercise its power of eminent domain to obtain all other needed land rights not otherwise obtained by the Authority. These sponsors will be responsible for the costs of engineering and legal services for acquisition of land rights for the single-purpose flood prevention measures. The planned structural measures will be installed by formal construction contracts as developed by competitive bids.

The Authority will provide relocation assistance services consisting of the following:

1. Provide personally, or by first class mail, written notice of displacement and appropriate application forms to each displaced person, business, or farm operation,

2. Assist in filing applications,

3. Review and take action on applications for relocation assistance,

4. Review and process grievances in connection with displacements, and

5. Make relocation payments.

The sponsors have determined that decent, safe, and sanitary replacement housing will be available for all persons subject to displacement by the project and that displaced persons will be given notice to vacate at least 90 days before they have to move. The Soil Conservation Service, as a part of its project administration, will assist the Authority in fulfilling its responsibilities.

Houses, roads, bridges, barns, and other fixed improvements involved in floodwater-retarding structure sites will be altered or modified as agreed upon by the Authority, the local branch of government responsible for roads, and the Service. The Authority will be responsible for the disposition of these facilities and other land rights matters.

The Soil Conservation Service will provide the Authority the engineering and technical assistance needed for design, preparation of specifications, inspection of construction, preparation of contract payment estimates, final inspection, execution of certificates of completion, and related tasks for the establishment of the planned single-purpose works of improvement for flood prevention.

The Authority will assume the responsibility for administering its contracts. The Authority, at a later date, may request the Soil Conservation Service to administer the contracts. The sediment pools of the floodwater-retarding structures will be correctly stocked with fish. These fish will be obtained from Federal, state, or private hatcheries. Technical assistance will be provided by the Soil Conservation Service in stocking and managing these pools for fish production. Dams will be constructed in accordance with the requirements and regulations of the Tennessee Department of Public Health.

81. LOCAL COOPERATION REQUIRED FOR CORPS OF ENGINEERS FEATURES

This section describes requirements for local cooperation for project features to be constructed by or with Federal funds through the Corps of Engineers. Local costs as shown are based on current estimates, and will be adjusted to reflect actual costs during project installation and operation.

a. The reservoir feature of the project will require local cooperation in accordance with the Federal Water Project Recreation Act. Accordingly, non-Federal interests will be required to:

(1) Pay or contribute in kind 5 percent of the first cost of the reservoir, including real estate, relocations, and all other costs associated with reservoir construction, a sum currently estimated to be $1,300,000, which is 50 percent of the estimated separable cost for recreation storage.

(2) Pay or contribute in kind 50 percent of first costs associated with development of water-based recreation facilities, including lands for the North Park; and South Park, sums currently estimated to be $988,000 for the North Park and $3,246,500 for the South Park.

(3) Administer the recreation facilities and bear all costs of operation, maintenance, and replacement related thereto, sums currently estimated at $20,000 annually for the North Park and $120,000 annually for the South Park.

b. Local cooperation which will be required for the flood control and recreation improvements associated with the channel improvement and greenway development follows:

(1) Pay or contribute in kind 75 percent of the total cost of lands within the proposed greenway which represents 100 percent of the estimated cost of lands which will be specifically needed for channel enlargement and 50 percent of the estimated cost for those lands which will be developed for recreation. Total estimated local cost for greenway lands is $8,105,000.

(2) Provide without cost to the United States lands outside the greenway which may be needed for spoil disposal; relocation assistance and payments required to comply with the provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646; and all alterations and replacement of utilities, bridges, streets, and highways, which may be required for construction of the project, except railroads and interstate pipelines currently estimated at $908,500.

(3) Pay or contribute in kind 50 percent of the total first cost of recreational and environmental improvements to be installed in the greenway, currently estimated to be $386,000.

(4) Maintain and operate all works after project completion and comply with Section 221, Public Law 91-611. Operation and maintenance costs of the channel and greenway are currently estimated at $636,000 annually.

(5) Hold and save the United States free from damages due to construction of the project.

82. ADVANCE LAND ACQUISITION

Local sponsors are proceeding to purchase lands which will be needed for the proposed project, including lands for the reservoirs which would be a Federal responsibility under the local cooperation requirements. The purpose of the advance acquisition is to prevent increased development on project lands and increased land values from making project costs prohibitive. In accordance with the Federal and local cost-sharing policies recommended in this report, local sponsors will be reimbursed for actual cost of lands which have been purchased at the time of project construction and are a Federal responsibility, as may be determined reasonable, plus all reasonable acquisition costs except salaries and expenses of local sponsor employees, provided the sponsors transfer the ownership of lands in the Nonconnah Reservoir in fee title to the United States for the purpose of construction and operation of the flood control project. Funds reimbursed to local sponsors for land acquisition will be available to meet other local cost requirements. The Chickasaw Basin Authority will retain ownership of the Johns Creek reservoirs and will bear all administrative costs of land acquisition for the Johns Creek reservoirs.

SECTION XVIII - STATEMENT OF FINDINGS

83. STATEMENT OF FINDINGS

The District Engineer, Memphis District, Corps of Engineers, and the Tennessee State Conservationist, Soil Conservation Service have reviewed and evaluated, in the light of the overall public interest, the documents concerning the proposed action, as well as the stated views of other interested agencies and the concerned public, relative to the various practical alternatives in accomplishing the objective of providing flood control, water-based recreation, and environmental enhancement in the Nonconnah Creek Basin.

The possible consequences of these alternatives have been studied according to engineering feasibility, environmental effects, social well-being and economic effects of both regional and national economic development nature. In evaluation, the following points were considered pertinent:

a. Problem Statement. Nonconnah Creek rises in rural areas east of Memphis and flows through the Memphis urban area. The Nonconnah floodplain particularly inside the city limits, is extensively developed. Properties of several thousand people are subject to flooding from rainfall runoff. Runoff and the threat of flooding are increasing as urban development continues. Lower reaches of the floodplain are also subject to backwater flooding from the Mississippi River, but there is little development within the backwater area. There is a need for preservation of natural areas, open space, and developments to provide recreation opportunity for the Memphis area population.

b. Engineering Considerations. The nature of the problem and physical characteristics of the area provide for consideration of several alternative solutions to the headwater flood problem, while at the same time, will provide needed recreational opportunity and environmental enhancement.

Project features considered to reduce flood damages were: (1) construction of headwater retarding structures, (2) channel enlargement, and (3) construction of a closure and pumping plant to prevent backwater flooding from the Mississippi River. Additional project features were considered for recreation, preservation of natural areas, open space, development of recreation facilities, and landscaping within a greenway to be preserved along the channel.

In the absence of the proposed structural measures, an alternative would be to implement some type of floodplain zoning to control further

development in the flood areas. However, very little could be done by this method to eliminate the flood damages which occur to existing developments in the flood zone. Approximately 75% of the existing and projected future flood damages will result from damages to existing developments. This damage will result from increased runoff and reduced time for concentration, and therefore increased discharge rates, flood elevations, and increased flood damages on existing development. resulting from changed land use by urbanization of the entire watershed. The only alternative means of eliminating future increased damages to existing development would be to restrict further urbanization in the 117,200 acre drainage area of the Nonconnah Basin. Considering the rapid and dynamic rate of growth in the Memphis Metropolitan area, eliminating future development in the Nonconnah Watershed area is clearly not economical, practical, or reasonable.

Engineering and economic evaluation of project alternatives, including engineering design, was based on future land use in the Nonconnah Basin as outlined in land use plans developed by local governmental agencies.

The closure and pumping plant to control backwater flooding is not economically justified at this time and is not a part of the recommended plan.

Based on engineering and environmental analyses, the recommended plan consists of an extensive program of land treatment by U.S.D.A. to control headwater erosion and subsequent siltation; three headwater control structures to be constructed by the Soil Conservation Service on the Johns Creek Tributary; construction of a larger structure on Nonconnah Creek by the Corps of Engineers to be fully developed for recreation; preservation of a 600-foot wide greenway to extend from the Mississippi River to the proposed lake, a distance of approximately 20 miles, with channel enlargement in the lower 11 miles to be constructed by the Corps of Engineers.

c. Environmental Considerations. The existing physical environmental setting of the project area can be greatly enhanced through the construction of a project to eliminate persistent flood damages and provide for development of the water and related land resources. There is little vegetation within the project area because of urban development. Existing vegetation is being rapidly destroyed by continuing development. The recommended plan provides for preservation of natural areas within the proposed greenway and recreation areas adjacent to the proposed Nonconnah Lake. Many areas within the proposed greenway which have been cleared and used as borrow areas for landfills will be landscaped and replanted to vegetation. The general overall appearance of the project area will be much more pleasing with construction of the project and related beautification features. The recommended plan requires the least disturbance

of natural environmental features of all alternatives considered and will preserve many areas which would otherwise be disturbed by urbanization.

d. Social and Economic Considerations. The proposed development will provide opportunity for recreation and environmental experiences to many people living in the Memphis urban area and surrounding communities. Of particular significance are the opportunities which will be afforded low income families within the urban area who would not be able to travel and seek these experiences in other places. Studies show that continued urbanization will continue and flood damages will continue to increase if protection is not provided. With construction of the project features recommended for construction, average annual losses in the Nonconnah Creek and Johns Creek floodplains will be reduced from $4,931,300 to $43,700.

The proposed action is based on thorough analyses and evaluation of various practical alternative courses of action for achieving the stated objective; wherever adverse effects are found to be involved, they cannot be avoided by following reasonable alternative courses of action which would achieve the specified purpose; where the proposed action has an adverse effect, this effect is either ameliorated or substantially outweighed by other considerations of national policy; the recommended action is consonant with national policy, statutes, and administrative directives; and on balance the total public interest should best be served by the implementation of the recommendation.

SECTION XIX - CONCLUSIONS AND RECOMMENDATIONS

84. CONCLUSIONS

There are definite needs for improvements in the Nonconnah Creek Basin to reduce flood, erosion and sediment damages to rural and urban areas. The lower reaches of the Nonconnah floodplain are within the city of Memphis. Several thousand buildings, including homes, businesses, churches, and schools are subject to flooding. Urbanization is continuing into upstream areas, which will increase runoff and corresponding flood threat, as well as increasing the value of property subjected to flooding. In addition, there are needs for open space, environmental preservation and enhancement, and opportunities for water-based recreation. Studies show that the recommended plan, generally as described in Section XII, provides much needed flood protection, watershed protection, environmental enhancement, and recreation development, and is economically feasible. It is concluded that Federal assistance is warranted to alleviate threat of flooding in the Nonconnah Creek Basin. It is further concluded that the proposed improvements are needed to provide recreation opportunity and preserve environmental values in the Nonconnah Creek Basin and are economically justified. Several alternatives for flood control were considered by the Corps of Engineers and Department of Agriculture, including a wide range of sizes and several combinations of reservoir storage, and several alternative channel improvement proposals. Local sponsors have agreed that one multiple-purpose reservoir and three floodwater-retarding reservoirs would meet project objectives. Sponsors agreed that the structural program of reservoirs and channel improvement is economically sound and feasible and is the best combination of those studied. The recommended plan best meets the needs for flood control, watershed protection and recreation development. It has been concluded that any plan of flood control for the urban development in the Nonconnah floodplain should provide as a mimimum protection from the 100-year frequency flood occurrence. The recommended plan will provide that level of protection for headwater flooding. Project features for control of Mississippi River backwater flooding are not economically feasible and are not recommended for construction at this time.

85. RECOMMENDATIONS

a. It is recommended by the District Engineer, Memphis District, Corps of Engineers, that the improvement of Nonconnah Creek by the Corps of Engineers, generally as described in this report, be authorized for construction with such modifications as the Chief of Engineers may find advisable, at an estimated cost to the United States of $41,515,000.

These recommendations are made subject to the provision that prior to construction local interests give assurances satisfactory to the Secretary of the Army that they will:

<u>For the Nonconnah Reservoir Development</u>

(1) Pay or contribute in kind 5 percent of the first cost of the reservoir.

(2) Pay or contribute in kind 50 percent of first costs associated with development of recreation facilities, including rights-of-way for park facilities.

(3) Operate, maintain, and replace all recreation facilities.

<u>For the Channel Improvement and Greenway Development</u>

(1) Pay or contribute in kind 75 percent of the total cost of lands, easements and rights-of-way within the proposed greenway.

(2) Provide without cost to the United States lands outside the greenway which may be needed for spoil disposal; relocation assistance and payments required to comply with the provisions of the Uniform Relocations Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646; all alterations and replacements of utilities, bridges, streets, and highways which may be required for construction of the project, except railroad facilities and interstate pipelines.

(3) Pay or contribute in kind 50 percent of the total first cost of recreational and environmental improvements to be installed in the greenway.

(4) Operate and maintain all works after project completion and bear all costs thereof, and comply with Section 221, Public Law 91-611.

(5) Hold and save the United States free from damages due to construction of the project.

b. It is recommended by the State Conservationist for the Soil Conservation Service in Tennessee that the improvements proposed in this report for implementation by the U. S. Department of Agriculture, be installed substantially in accordance with the terms, conditions and stipulations provided for in the plan, or as the plan may be modified by mutual agreement with the sponsors, such works of improvements to be installed at an estimated Federal cost of $8,356,000.

These recommendations are made subject to the provision that prior to the installation of the planned works of improvement the local sponsors execute a Watershed Work Plan Agreement with the Soil Conservation

Service subscribing to the plan and setting forth obligations, duties and responsibilities of the U. S. Department of Agriculture and the local organizations sponsoring the project and give assurances satisfactory to the Secretary of Agriculture that they will:

For the Johns Creek Structures

(1) Acquire all land, easements, and rights-of-way, the cost of which will be borne by Federal funds.

(2) Provide relocation assistance advisory services and make the relocation payments to displaced persons as required by the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646, 84 Stat. 189) effective as of January 2, 1971, and the regulations issued by the Secretary of Agriculture pursuant thereto. The real property acquisition policies contained in said Act shall be followed in all cases.

(3) Operate and maintain all structural measures.

(4) Obtain agreements from owners of not less than 50 percent of the land above each floodwater-retarding structure that they will carry out conservation plans on their land.

For the Land Treatment Program

(1) Provide assistance to landowners and operators to assure the installation of the land treatment measures.

(2) Encourage landowners and operators to operate and maintain the land treatment measures for the protection and improvement of the watershed.

A C Lehman
A. C. LEHMAN
Colonel, Corps of Engineers
District Engineer
Memphis, Tennessee

Paul M. Howard
PAUL M. HOWARD
State Conservationist
Soil Conservation Service
Nashville, Tennessee

c. The following sponsoring local organizations concur in the above recommendations.

Robert B. James

ROBERT B. JAMES
Chairman
Chickasaw Basin Authority

R. E. Turman

R. E. TURMAN
Chairman
DeSoto County Soil and Water Conservation District

A. K. McCalla

A. K. MCCALLA
Chairman
Shelby County Soil Conservation District

R. G. Houston

R. G. HOUSTON
Chairman
Marshall County Soil and Water Conservation District

CORPS OF ENGINEERS

U. S. ARMY

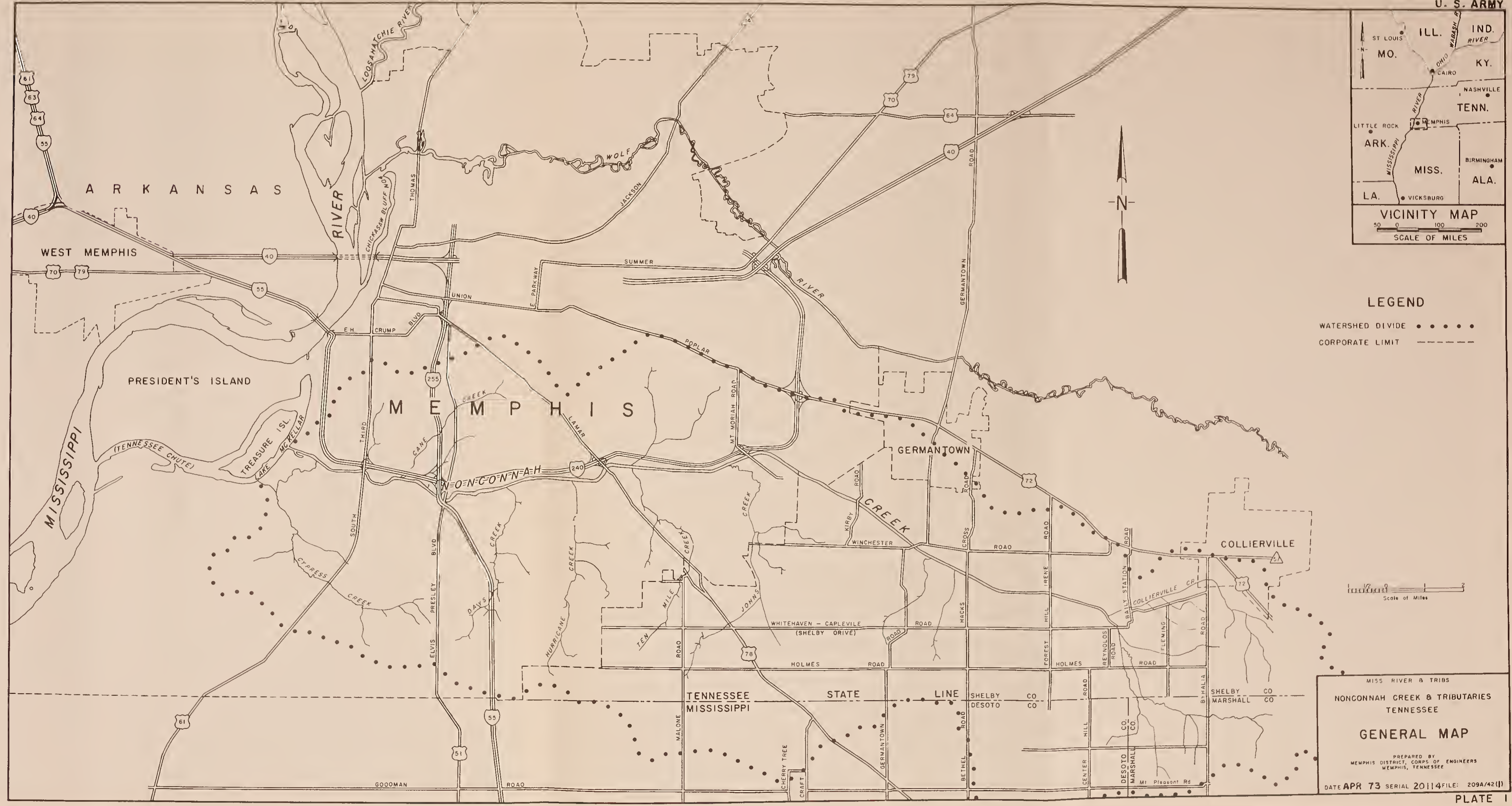
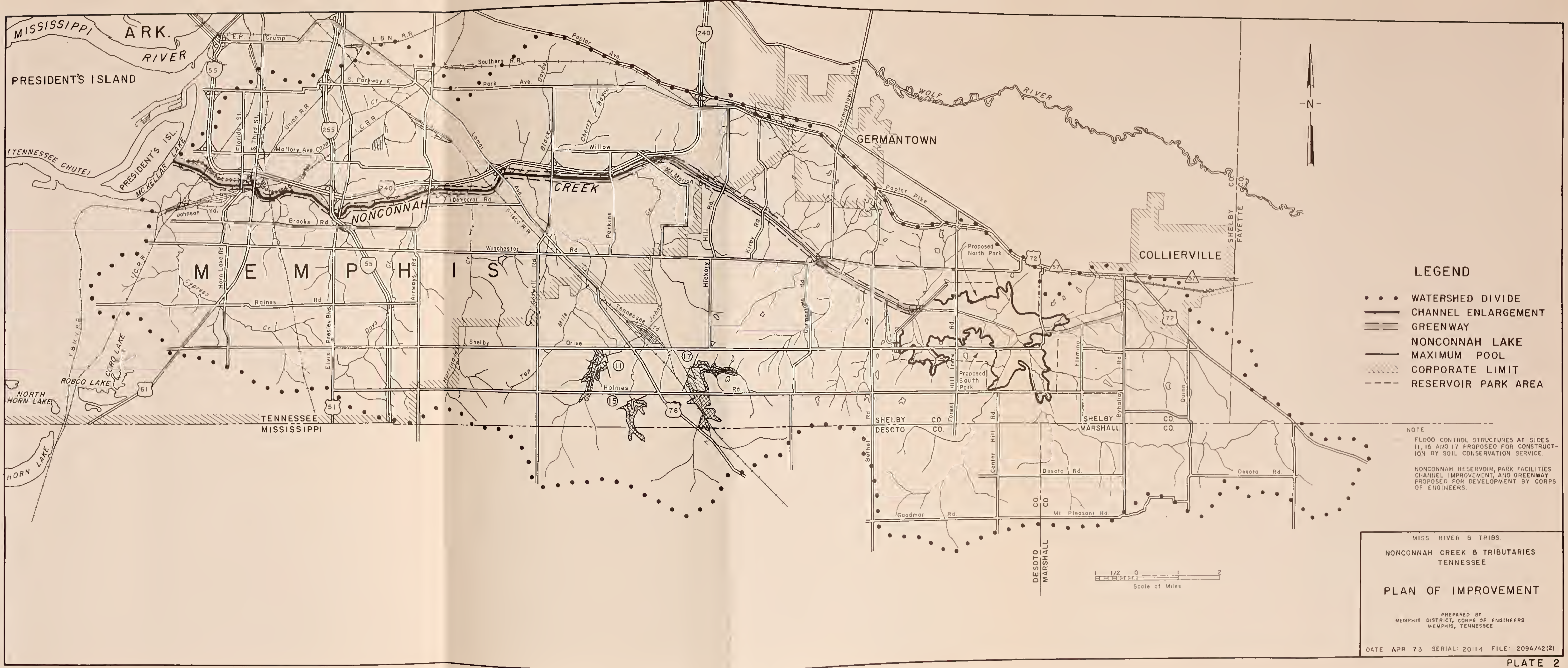
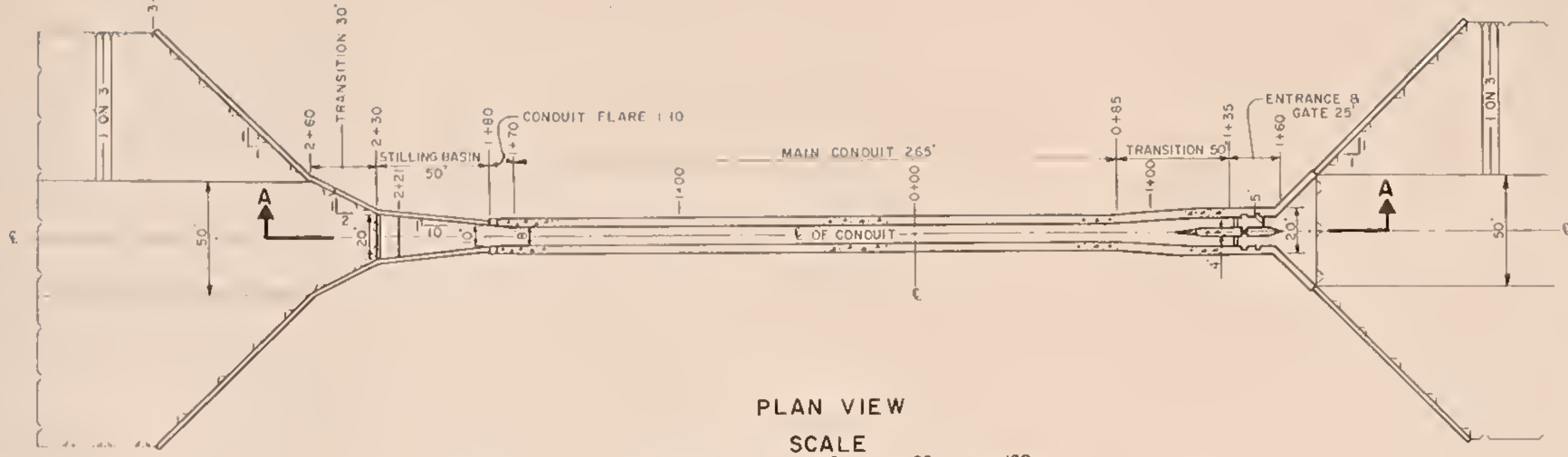


PLATE 1



MISSISSIPPI RIVER
ARK.
PRESIDENT'S ISLAND
PRESIDENT'S ISL.
McKELLAR LAKE
(TENNESSEE CHUTE)
NONCONNAH CREEK
M E M P H I S
GERMANTOWN
COLLIERVILLE
WOLF RIVER
ROBCO LAKE
NORTH HORN LAKE
HORN LAKE
TENNESSEE
MISSISSIPPI
SHELBY CO.
DESOTO CO.
SHELBY CO.
MARSHALL CO.
SHELBY CO.
FAYETTE CO.
Proposed North Park
Proposed South Park
N
LEGEND
WATERSHED DIVIDE
CHANNEL ENLARGEMENT
GREENWAY
NONCONNAH LAKE
MAXIMUM POOL
CORPORATE LIMIT
RESERVOIR PARK AREA
NOTE
FLOOD CONTROL STRUCTURES AT SITES 11, 15 AND 17 PROPOSED FOR CONSTRUCTION BY SOIL CONSERVATION SERVICE.
NONCONNAH RESERVOIR, PARK FACILITIES CHANNEL IMPROVEMENT, AND GREENWAY PROPOSED FOR DEVELOPMENT BY CORPS OF ENGINEERS.
Scale of Miles
MISS RIVER & TRIBS.
NONCONNAH CREEK & TRIBUTARIES
TENNESSEE
PLAN OF IMPROVEMENT
PREPARED BY
MEMPHIS DISTRICT, CORPS OF ENGINEERS
MEMPHIS, TENNESSEE
DATE APR 73 SERIAL: 20114 FILE: 209A/42(2)

PLATE 2



PLAN VIEW

SCALE

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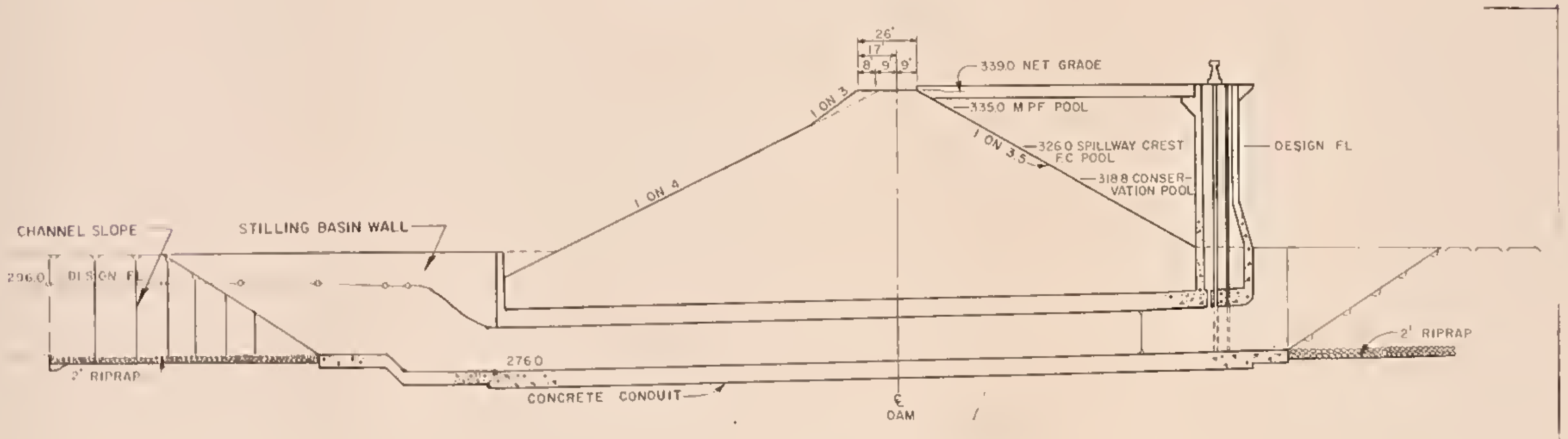
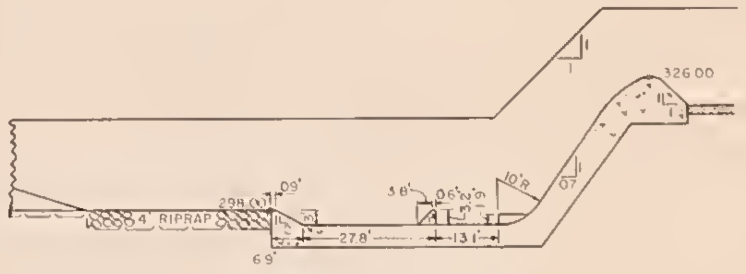


SECTION A-A



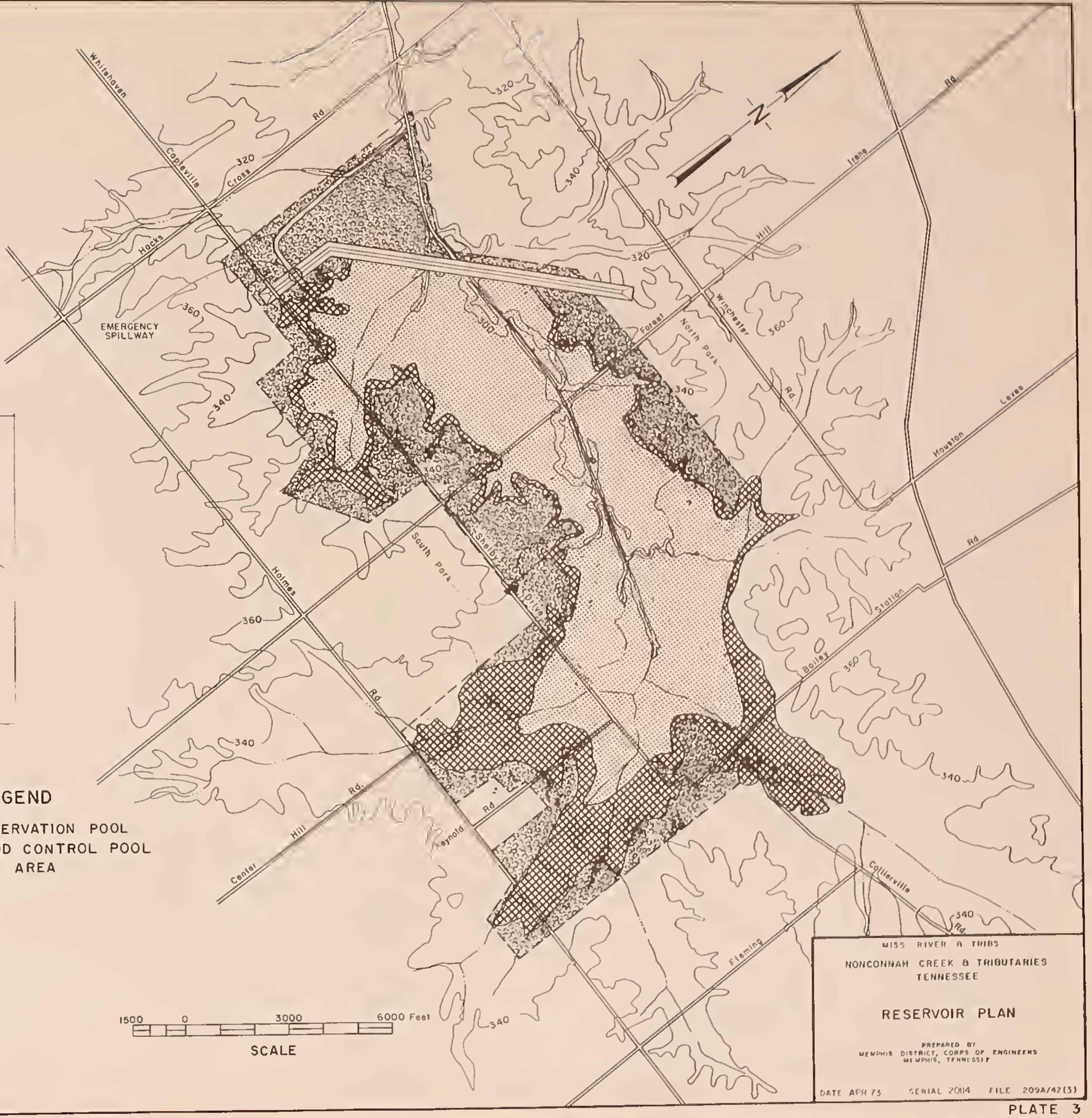
EMERGENCY SPILLWAY
WEIR SECTION

SCALE

20 0 20 40 60

LEGEND

- CONSERVATION POOL
- FLOOD CONTROL POOL
- PARK AREA



1500 0 3000 6000 Feet

SCALE

MISS RIVER & TRIBS

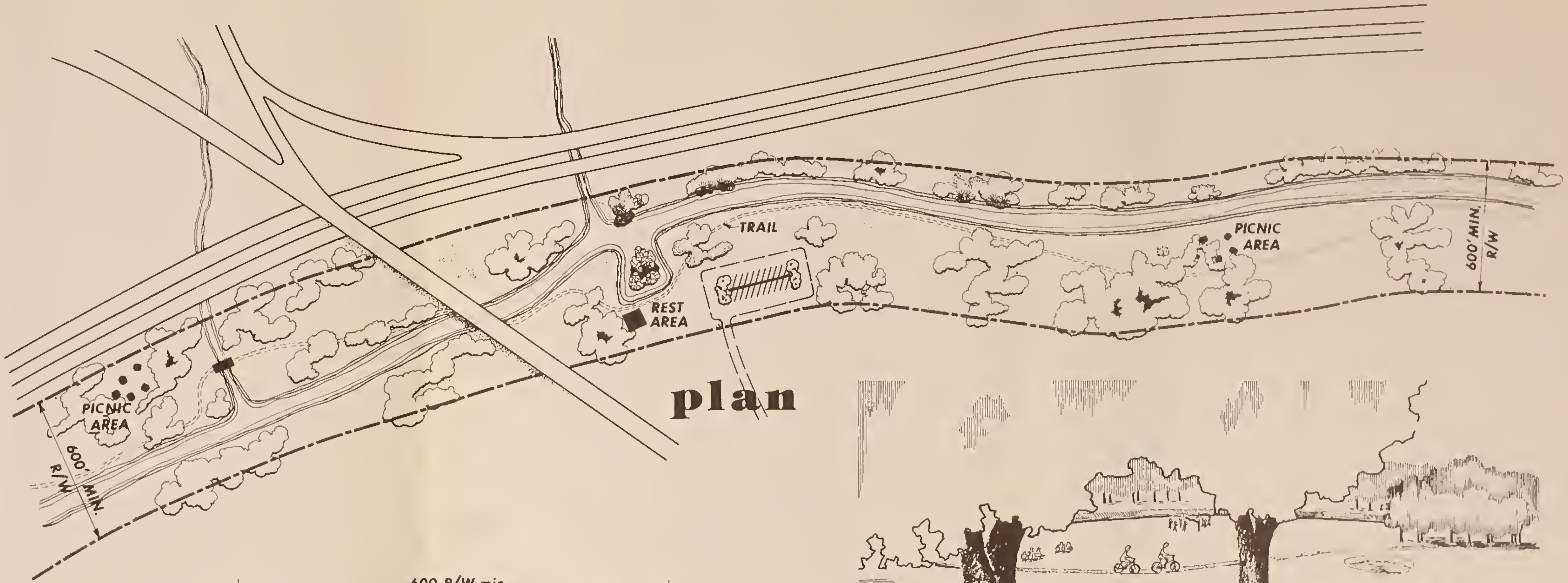
NONCONNAH CREEK & TRIBUTARIES
TENNESSEE

RESERVOIR PLAN

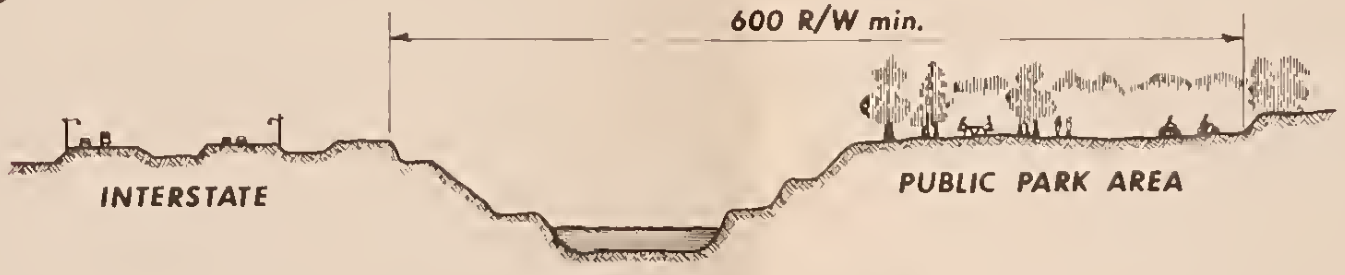
PREPARED BY
MEMPHIS DISTRICT, CORPS OF ENGINEERS
MEMPHIS, TENNESSEE

DATE APR 73 SERIAL 2014 FILE 209A/42(3)

PLATE 3



plan



typical section

typical park area

MISS. RIVER and TRIBS.

NONCONNAH CREEK and TRIBUTARIES
TENNESSEE

PLAN AND SECTION
PREPARED BY
MEMPHIS DISTRICT, CORPS OF ENGRS.
MEMPHIS, TENN.

DATE: APR73 SERIAL: 20114 FILE: 209A/42(4)

USDA

Fold-out Placeholder

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4000

FEBRUARY 1973

SHEET I OF 4

PLATE 5

LEGEND

PROPOSED GREENWAY

OUTLINE OF 100 YEAR FLOOD WITHOUT PROJECT

AERIAL PHOTOGRAPHY FLOWN 8 AUGUST 1972

CORPS OF ENGINEERS, U S ARMY
MEMPHIS TENNESSEE DISTRICT

PROPOSED PROJECT

NONCONNAH CREEK

MEMPHIS, TENNESSEE

LEGEND

PROPOSED GREENWAY

OUTLINE OF 100 YEAR FLOOD WITHOUT PROJECT

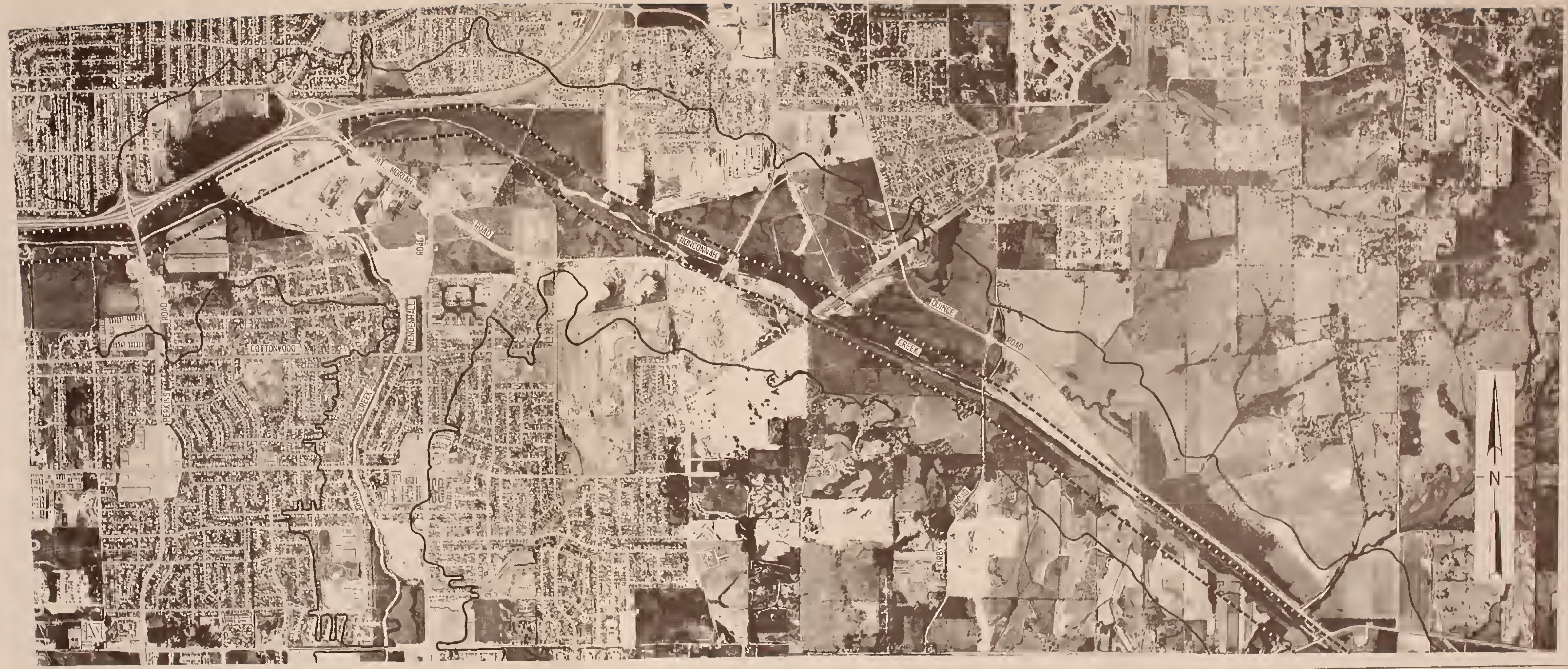
AERIAL PHOTOGRAPHY FLOWN 8 AUGUST 1972

CORPS OF ENGINEERS, U.S. ARMY
MEMPHIS TENNESSEE DISTRICT

PROPOSED PROJECT

NONCONNAH CREEK

MEMPHIS, TENNESSEE



LEGEND

PROPOSED GREENWAY

OUTLINE OF 100 YEAR FLOOD
WITHOUT PROJECT

AERIAL PHOTOGRAPHY FLOWN 8 AUGUST 1972

CORPS OF ENGINEERS, U. S. ARMY
MEMPHIS TENNESSEE DISTRICT

PROPOSED PROJECT

NONCONNAH CREEK

MEMPHIS, TENNESSEE

4000

SHEET 1 OF 4

PLATE 7

CORPS OF ENGINEERS, U S ARMY
MEMPHIS TENNESSEE DISTRICT
PROPOSED PROJECT
NONCONNAH CREEK
MEMPHIS, TENNESSEE
PLATE 8
N
WINCHESTER
ROAD
ROAD
CROSS
HACKS
NONCONNAH CREEK
SHELBY
DRIVE
FORREST HILL IRENE ROAD
HOLMES
ROAD
LEGEND
CONSERVATION POOL
FLOOD CONTROL POOL
PROPOSED GREENWAY AND OUTLINE OF 100 YEAR FLOOD WITH PROJECT
OUTLINE OF 100 YEAR FLOOD WITHOUT PROJECT
AERIAL PHOTOGRAPHY FLOWN 8 AUGUST 1972

APPENDIX A

HYDROLOGY AND HYDRAULICS

PROJECT FEATURES TO BE CONSTRUCTED BY CORPS OF ENGINEERS

INTERIM REPORT

NONCONNAH CREEK BASIN

GENERAL INVESTIGATION STUDIES

APPENDIX A

HYDROLOGY AND HYDRAULICS
PROJECT FEATURES TO BE CONSTRUCTED BY CORPS OF ENGINEERS

1. BASIN DESCRIPTION

Nonconnah Creek is located mostly in the southwestern corner of Tennessee with the remaining portion in northern Mississippi. The basin drainage area is 183.1 square miles, with a length of about 32 miles and a maximum width of about 10 miles. The main tributaries and their drainage areas are listed in table A-4.

2. CLIMATOLOGY

a. Climate. The United States Weather Bureau station, located at the Memphis International Airport, has a period of record from 1932 to date. The general climatic conditions recorded at this station are applicable to the study area. The recorded temperature extremes range from a maximum of 106 degrees in July of 1952, to a minimum of -13 degrees in December of 1963.

b. Precipitation. The maximum annual precipitation of 76.85 inches occurred in 1957 and the minimum annual precipitation of 30.54 inches occurred in 1941. The normal annual precipitation of about 50 inches is fairly well distributed throughout the year. The normal monthly rainfall in inches is as follows:

Table A-1

Normal Monthly Rainfall

January	5.00	July	3.35
February	4.41	August	3.24
March	5.15	September	2.89
April	5.02	October	2.73
May	4.17	November	4.07
June	3.61	December	4.57

c. Storms. Major storms occurring during the period of record in the Memphis area are listed below:

Table A-2

Major Storms During Period of Record
Accumulated Rainfall (inches)

DATE Month	Year	1 Hour	3 Hour	6 Hour	12 Hour	24 Hour
November	1934	2.00	4.68	-	-	10.48
October	1935	2.54	4.36	-	-	6.30
April	1949	0.95	2.19	2.60	4.32	4.79
May	1958	1.21	2.21	3.82	4.78	4.78
May	1965	0.84	2.21	3.59	4.90	4.90

3. RUNOFF AND STREAMFLOW DATA

a. Published Records. The U. S. Geological Survey installed a gage on the bridge at Winchester Road (mile 17.1) in October 1969. The flows to date have ranged from a maximum peak flow of 6,880 cfs on March 3, 1970, to no flow on several occasions each year. The gage has a drainage area of 68.4 square miles. From 1959 to 1964, there were occasional low flow measurements.

b. Unpublished Records. High water marks were established for the May 1958 storm. Pertinent data are as follows:

Table A-3

1958 Flood Profile

LOCATION	MILE	ELEVATION (FTMSL)
Horn Lake Road	1.70	211.0
U. S. Highway 61	2.02	213.0
Illinois Central R.R.	2.58	216.0
U. S. Highway 51	4.32	227.9
Airways Boulevard	6.65	240.8
St. Louis & S.F. R.R.	8.32	250.0
Getwell Road	9.98	256.0
Perkins Road	11.37	262.4
Mt. Moriah Road	12.35	268.0
Kirby Road	15.37	281.1

4. BASIS OF DESIGN

a. General. The Nonconnah Creek floodplain has experienced extensive growth and development over the last several years. In portions of the floodplain, the land is being filled for commercial purposes using fill excavated within the 600-foot area along the channel designated as a greenway. The city required that the land in the headwater area be filled to the elevation of the existing condition 100-year flood profile as shown in the SCS Flood Plain Information Report, dated July 1968. In the backwater area, land must be filled to an elevation of 233.5 feet msl, which is 1.5 feet above the 1937 flood. A stage-frequency curve for the Mississippi River at the mouth of Nonconnah Creek is shown on Plate No. A-1.

b. Soil Conservation Service Studies. The SCS has completed a floodplain study and a watershed work plan for the Nonconnah Creek Basin. The sections used in this study were furnished by SCS and surveyed in the year 1970. The hydrology developed for the floodplain study and watershed work plan by SCS was used in this study.

c. SCS Hydrology. In the watershed work plan, SCS assumed that the basin was completely urbanized and that the floodplain would be filled to within 300 feet of the center line of the channel.

A brief summary of the methods used by SCS in developing their hydrology follows:

The drainage area was divided into 63 sub-areas and a synthetic unit hydrograph was developed for each sub-area. Rainfall data from Technical Paper No. 40 was used in the development of the synthetic storms. Rainfall depth-duration curves for the various frequency storms are shown on Plate No. A-2. The 24-hour rainfall was distributed by using the SCS Type II storm distribution. Runoff curve number 80 was used in computing the rainfall excess, which was applied to the synthetic unit hydrographs to obtain the flood hydrographs for each sub-area. The flood hydrographs were combined and routed by the SCS "Convex Method" of flood-routing as outlined in SCS's National Engineering Handbook. A summary of discharge frequencies for various locations is shown in Table No. A-5. The frequency flows for existing and future conditions appeared reasonable in comparison with other frequency flows in West Tennessee. Three proposed SCS reservoirs on Johns Creek (Nos. 11, 15, and 17) were assumed to be in place for project conditions. Discharge hydrographs with and without the reservoirs for the 100-year storm on Johns Creek are shown on Plate No. A-3.

TABLE NO. A-4
NONCONNAH CREEK AND TRIBUTARIES
DRAINAGE AREA AND RIVER MILES

Location	Miles Above Mouth	Intervening Area	Tributary Area	Area Above Location
Source	30.0			
		53.2		
Corps of Engineers Reservoir	19.8			53.2
		33.7		
Johns Creek	11.8		27.2	114.1
		2.6		
Black Creek & Ten Mile Creek	9.3		16.2	132.9
		6.0		
Hurricane Creek	7.6		8.3	147.2
		2.0		
Days Creek	6.0		10.1	159.3
		7.9		
Cane Creek	3.1		6.8	174.0
		9.1		
Mouth (McKellar Lake)	0.0			183.1

TABLE NO. A-5
100-YEAR FLOOD DISCHARGES

LOCATION	DRAINAGE AREA (Square Miles)	EXISTING(1) (CFS)	FUTURE W/O PROJECT (CFS)	FUTURE W/PROJECT (CFS)
Horn Lake Rd.	179.1	35,500	49,500	45,200
U. S. Highway 61	175.8	35,000	49,300	45,000
Illinois Central R.R.	172.4	35,000	49,100	44,800
U. S. Highway 51	161.6	33,400	48,600	44,500
Airways Boulevard	147.1	31,600	45,100	39,600
Frisco R.R.	123.0	30,100	41,300	37,300
Getwell Road	111.4	25,800	35,400	28,300
Perkins Road	110.5	26,900	35,700	29,100
Mt. Moriah Road	83.3	22,400	26,600	18,400
Kirby Road	74.1	22,400	26,300	16,200
Winchester Road	66.0	22,100	26,200	14,400
Hacks Cross Road	57.8	20,600	25,300	6,400

(1) Taken from SCS's "Flood Plain Information Report", dated July 1968.

d. Hydrologic Criteria for Proposed Dam. The structure recommended on Nonconnah Creek will control runoff from a drainage area of approximately 53 square miles. The pertinent data are shown on Table No. A-6, and a storage-area curve is shown on Plate No. A-4.

(1) Unit Hydrograph. A synthetic unit hydrograph was used to develop the volume of runoff and peak discharges for the area above. The Synder's synthetic relations that are comparable to SCS's synthetic relations were used. The unit hydrograph peak was increased by 25 percent for developing the Probable Maximum Storm. Pertinent information concerning the synthetic unit hydrographs and the unit hydrographs are shown on Plate A-5.

(2) Sediment Storage. Storage needed to contain the sediment accumulation for a 100-year period was provided.

(3) Flood Control Storage. The structure contains the amount of storage needed to contain the runoff from a 100-year storm which is equal to an 8-inch 24-hour storm over the drainage area.

(4) Spillway Design Flood. The Probable Maximum Flood, which was used for the spillway design flood, was shown in Letter Report No. 1 on Nonconnah Creek, dated April 1973. This flood was routed through the reservoir assuming the flood control and recreation pools full at the start of the flood and the conduit closed. The inflow and outflow hydrographs for this flood are shown on Plate No. A-6.

(5) Minimum Discharge Release. The reservoir will be operated to provide a minimum flow of 3 cfs to assure esthetic condition for greenway users and reduce mosquito production in stagnant pools. The release will require less than 0.2 foot of storage per month, which will be less than monthly inflow from rainfall. The minimum release therefore will not require separable storage capacity.

e. Channel Design. The proposed channel is an earth channel designed to carry the 100-year storm in combination with overbank flow within a 600 foot floodway as described in paragraph 54 of the report. The design slope of the channel is .00094 foot per foot, which is the approximate existing grade. The velocities vary in the proposed improved channel from 4.9 to 8.6 f.p.s. under existing conditions and 7.6 to 9.8 f.p.s. under improved conditions. Under existing conditions active sloughing was noted in four isolated areas. An alternate plan of channelization only without reservoirs was studied and considered inadequate as a plausible alternative because of the longer duration of excessive velocities. The velocity profile on plate A-7 for Nonconnah Creek below Johns Creek graphically demonstrates the considerable difference of durations in velocity between the two plans. The proposed plan will have high velocities that will result in

some scour, however, this plan was recommended. The discharge hydrographs for these two plans are shown on Plate No. A-8, for Nonconnah just below Johns Creek. The improved channel on these and other areas which may be subject to erosion will be protected by riprap. The design data for all channel improvements are shown on Table No. A-7.

f. Flowlines. Flowlines were computed, using a Manning's coefficient of 0.050 for existing channel, 0.030 to 0.035 for improved channel, 0.040 for cleaned out channel, 0.080 for the greenway, and 0.150 for overbank. Profiles showing existing and improved flowlines and design bottom widths and grades are shown on Plate No. A-9. Typical cross sections of the channel are shown on Plate No. A-10.

g. Standard Project Flood. The S.P.F. was shown in Letter Report No. 1 on Nonconnah Creek, dated April 1973.

TABLE NO. A-6
RESERVOIR PERTINENT DATA

ITEM	UNIT	CofE Reservoir	SOIL CONSERVATION SERVICE STRUCTURES NUMBERS 11	15	17
Drainage Area	Sq.Mi.	53.24	5.43	1.59	7.90
Tc	Hrs.	5.0	1.16	0.63	1.27
Elev. Top of Dam	Ft. MSL	339.0	338.5	349.0	331.0
Elev. Crest Emergency Spillway	Ft. MSL	326.0	330.1	342.3	322.3
Maximum Height of Dam	Ft.	37	35	28	32
Total Capacity	Ac. Ft.	31,000	2,351	739	3,004
Sediment	Ac. Ft.	6,195	696	214	756
Recreation	Ac. Ft.	6,905	-	-	-
Flood Control	Ac. Ft.	18,000	1,655	525	2,248
Capacity Equivalents					
Sediment Volume	Mil T	13.52	1.52	0.47	1.65
	In.	2.18	2.40	2.52	1.79
Recreation Volume	In.	2.40	-	-	-
Flood Control Volume	In.	6.34	5.72	6.19	5.33
Surface Area					
Sediment Pool	Acres	1,200	125	47	200
Recreation Pool	Acres	1,900	-	-	-
Flood Control Pool	Acres	3,280	280	98	430
Emergency Spillway					
Type		Ogee	Veg.	Veg.	Chute
Bottom Width	Ft.	500	300	150	300
Maximum Water Surface	Ft. MSL	335.0	332.6	334.0	324.6
Size of Conduit	DIM	8' X 10'	36"	30"	54"

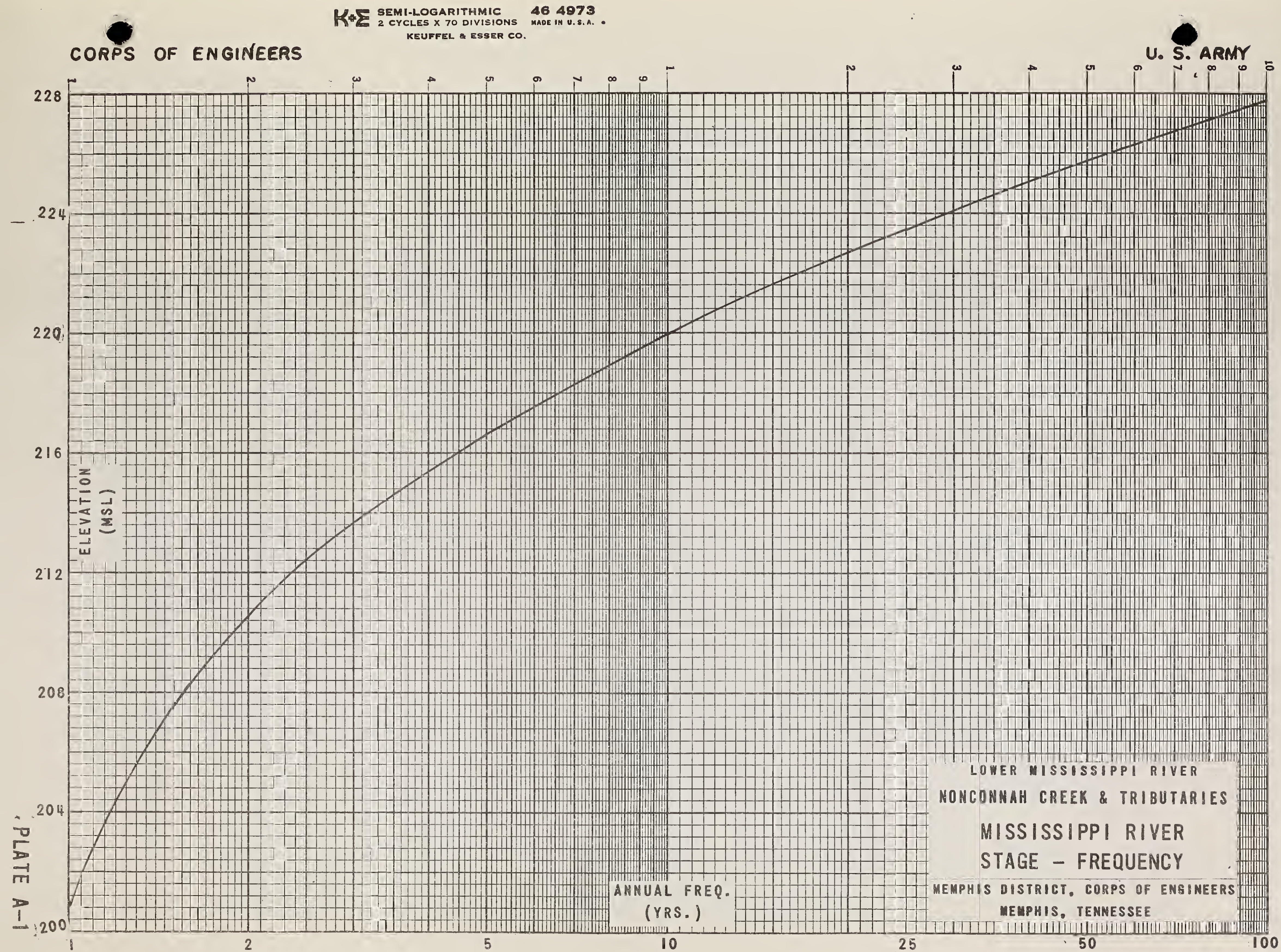
TABLE A-7

Nonconnah Creek

Drainage Areas and Design Capacity

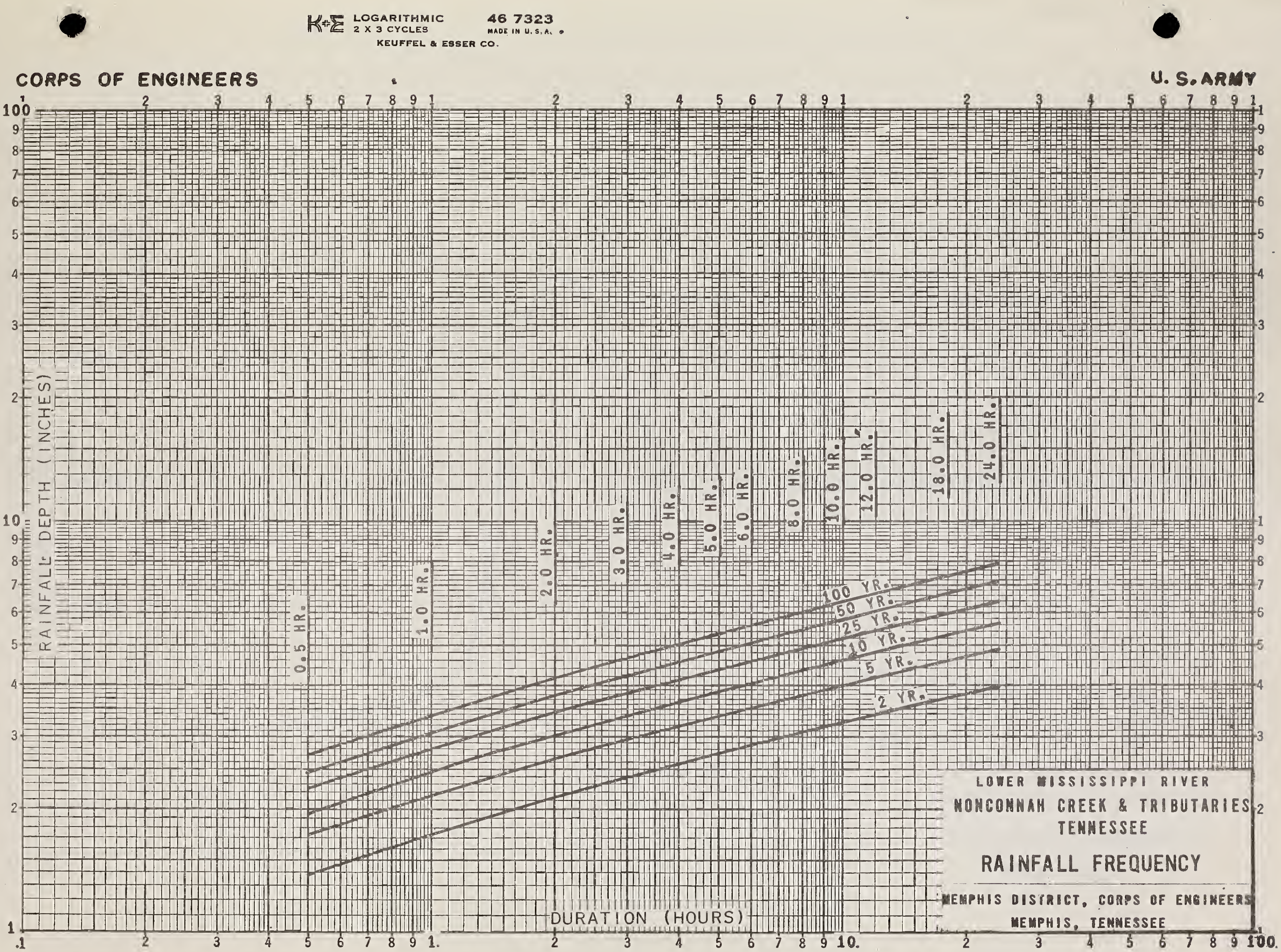
Reach From (mi)	Reach To (mi)	Type Improvement	Drainage Area (sq mi)	Design Discharge (cfs)	Design Velocity (fps)	Bottom Width (ft)	Depth Flow (ft)
0.0	4.3 1/	Enlargement	161.6	44,500-45,400	4.05-8.20	110 2/	24.5-43.0
4.3	9.3	Enlargment	132.9	36,800-44,500	7.59-9.50	110 2/	19.8-24.5
9.3	11.8	Enlargement	114.1	28,300-29,100	8.28-9.15	90 2/	19.8-20.0
11.8	17.1	Cleanout	68.4	14,400-18,400	6.90-7.41	40 3/	20.0-20.8

1/ Mississippi River Backwater Area
2/ Side Slope 1:4
3/ Side Slope 1:2



K+E SEMI-LOGARITHMIC 46 4973
2 CYCLES X 70 DIVISIONS MADE IN U.S.A.
KEUFFEL & ESSER CO.
CORPS OF ENGINEERS
U. S. ARMY
ELEVATION (MSL)
228
224
220
216
212
208
204
200
ANNUAL FREQ. (YRS.)
1
2
5
10
25
50
100
LOWER MISSISSIPPI RIVER
NONCONNAH CREEK & TRIBUTARIES
MISSISSIPPI RIVER
STAGE - FREQUENCY
MEMPHIS DISTRICT, CORPS OF ENGINEERS
MEMPHIS, TENNESSEE

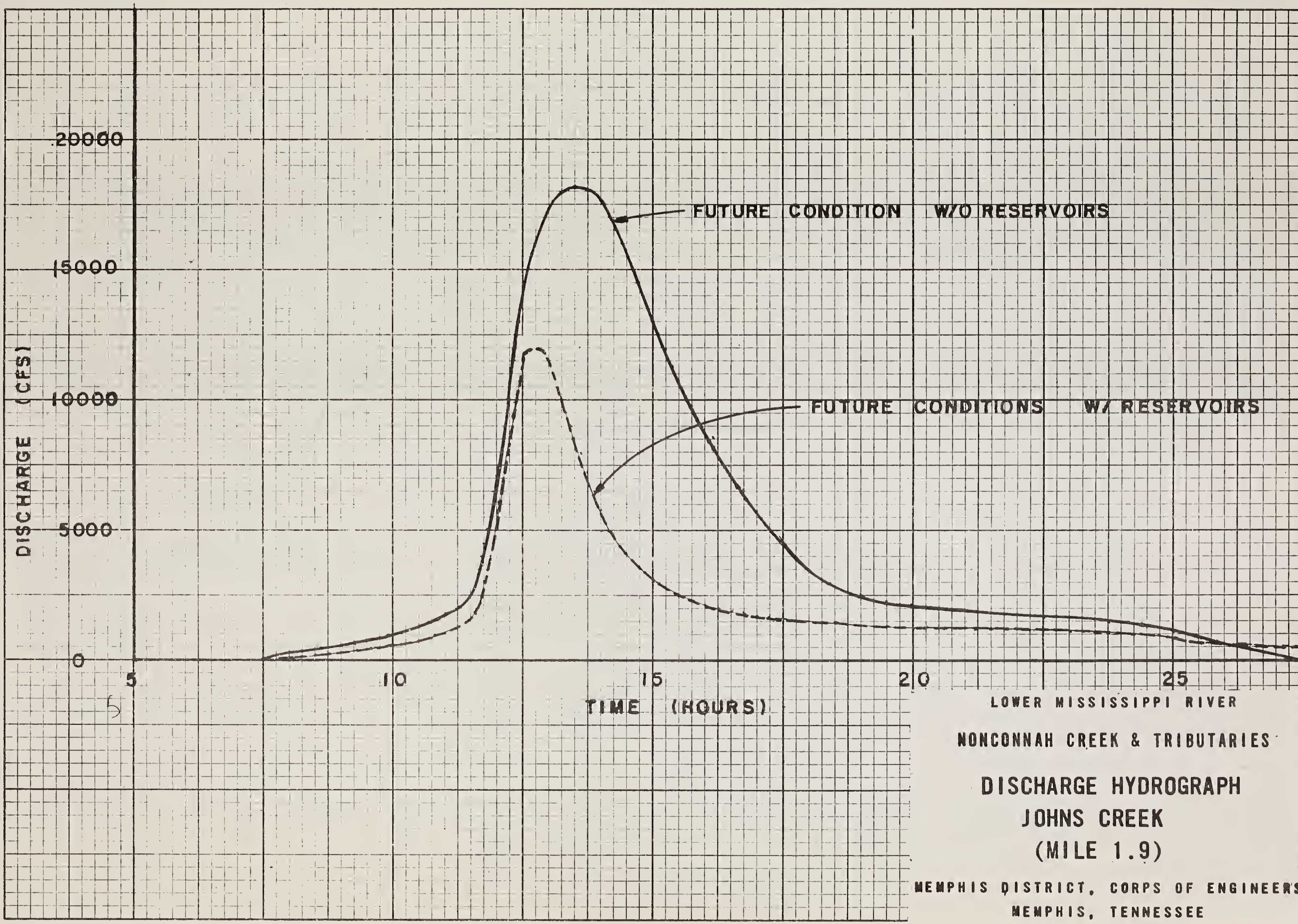
PLATE A-1



K+E LOGARITHMIC 2 X 3 CYCLES
KEUFFEL & ESSER CO.
46 7323 MADE IN U.S.A.
CORPS OF ENGINEERS
U.S. ARMY
RAINFALL DEPTH (INCHES)
DURATION (HOURS)
0.5 HR.
1.0 HR.
2.0 HR.
3.0 HR.
4.0 HR.
5.0 HR.
6.0 HR.
8.0 HR.
10.0 HR.
12.0 HR.
18.0 HR.
24.0 HR.
100 YR.
50 YR.
25 YR.
10 YR.
5 YR.
2 YR.
LOWER MISSISSIPPI RIVER
NONCONNAH CREEK & TRIBUTARIES
TENNESSEE
RAINFALL FREQUENCY
MEMPHIS DISTRICT, CORPS OF ENGINEERS
MEMPHIS, TENNESSEE

CORPS OF ENGINEERS

U.S. ARMY



LOWER MISSISSIPPI RIVER

NONCONNAH CREEK & TRIBUTARIES

DISCHARGE HYDROGRAPH
JOHNS CREEK
(MILE 1.9)

MEMPHIS DISTRICT, CORPS OF ENGINEERS
MEMPHIS, TENNESSEE

PLATE A-3

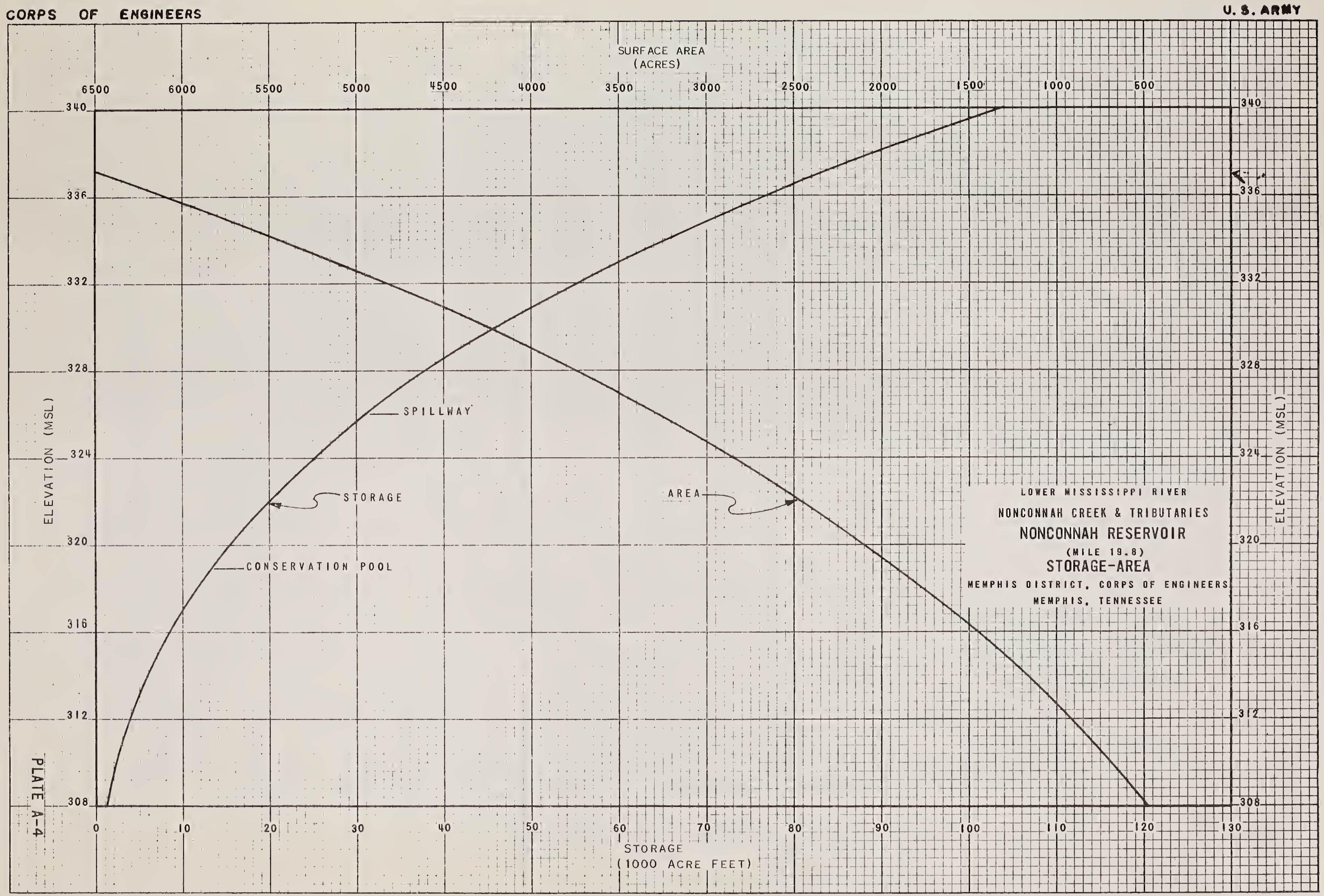
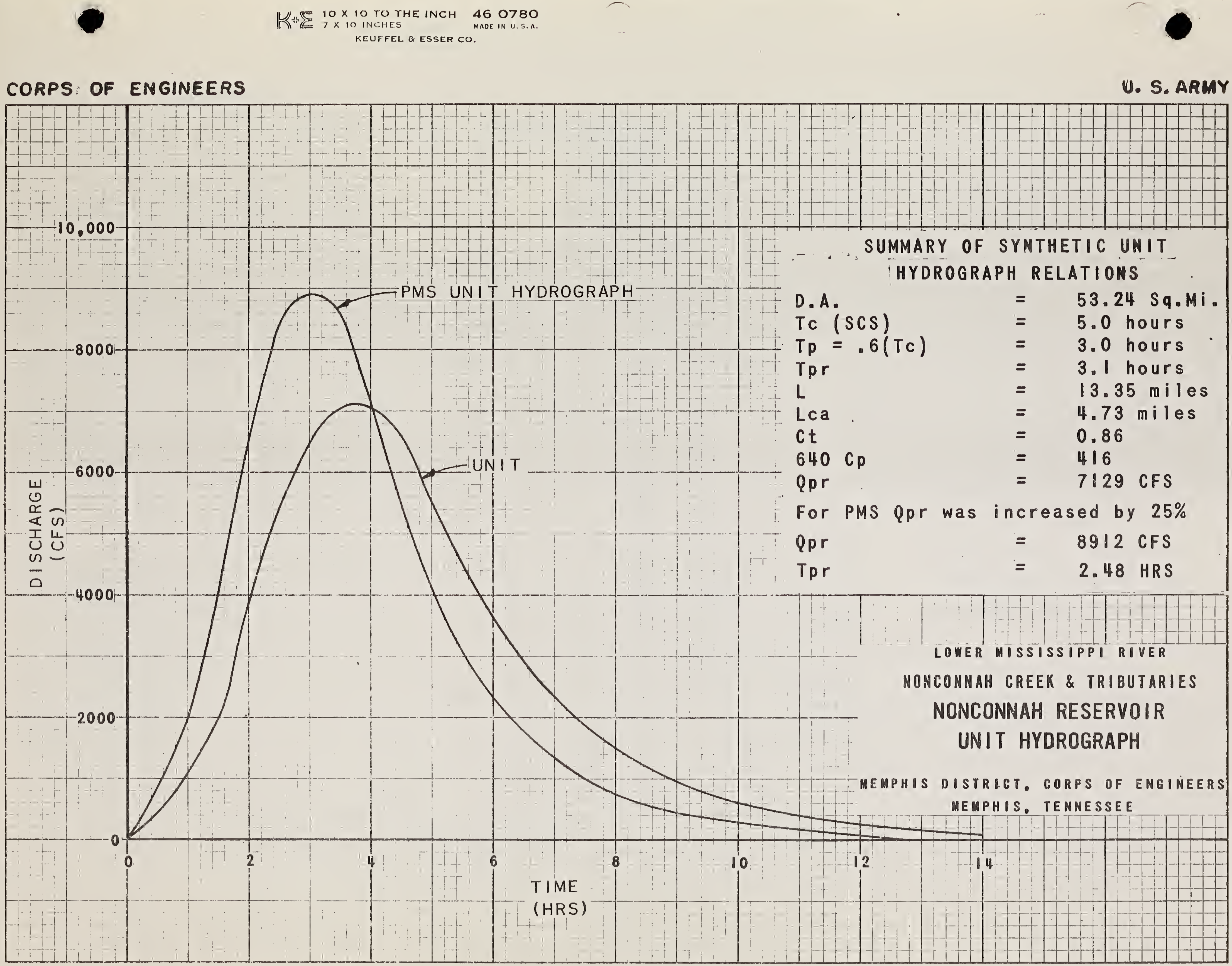

CORPS OF ENGINEERS
U. S. ARMY
SURFACE AREA
(ACRES)
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
ELEVATION (MSL)
340
336
332
328
324
320
316
312
308
SPILLWAY
STORAGE
AREA
CONSERVATION POOL
LOWER MISSISSIPPI RIVER
NONCONNAH CREEK & TRIBUTARIES
NONCONNAH RESERVOIR
(MILE 19.8)
STORAGE-AREA
MEMPHIS DISTRICT, CORPS OF ENGINEERS
MEMPHIS, TENNESSEE
0
10
20
30
40
50
60
70
80
90
100
110
120
130
STORAGE
(1000 ACRE FEET)

PLATE A-4



K+E 10 X 10 TO THE INCH 46 0780
7 X 10 INCHES MADE IN U.S.A.
KEUFFEL & ESSER CO.
CORPS OF ENGINEERS
U. S. ARMY
10,000
8000
6000
4000
2000
0
DISCHARGE
(CFS)
PMS UNIT HYDROGRAPH
UNIT
0
2
4
6
8
10
12
14
TIME
(HRS)
SUMMARY OF SYNTHETIC UNIT
HYDROGRAPH RELATIONS
D.A. = 53.24 Sq.Mi.
Tc (SCS) = 5.0 hours
Tp = .6(Tc) = 3.0 hours
Tpr = 3.1 hours
L = 13.35 miles
Lca = 4.73 miles
Ct = 0.86
640 Cp = 416
Qpr = 7129 CFS
For PMS Qpr was increased by 25%
Qpr = 8912 CFS
Tpr = 2.48 HRS
LOWER MISSISSIPPI RIVER
NONCONNAH CREEK & TRIBUTARIES
NONCONNAH RESERVOIR
UNIT HYDROGRAPH
MEMPHIS DISTRICT, CORPS OF ENGINEERS
MEMPHIS, TENNESSEE

PLATE A-5

CORPS OF ENGINEERS U. S. ARMY

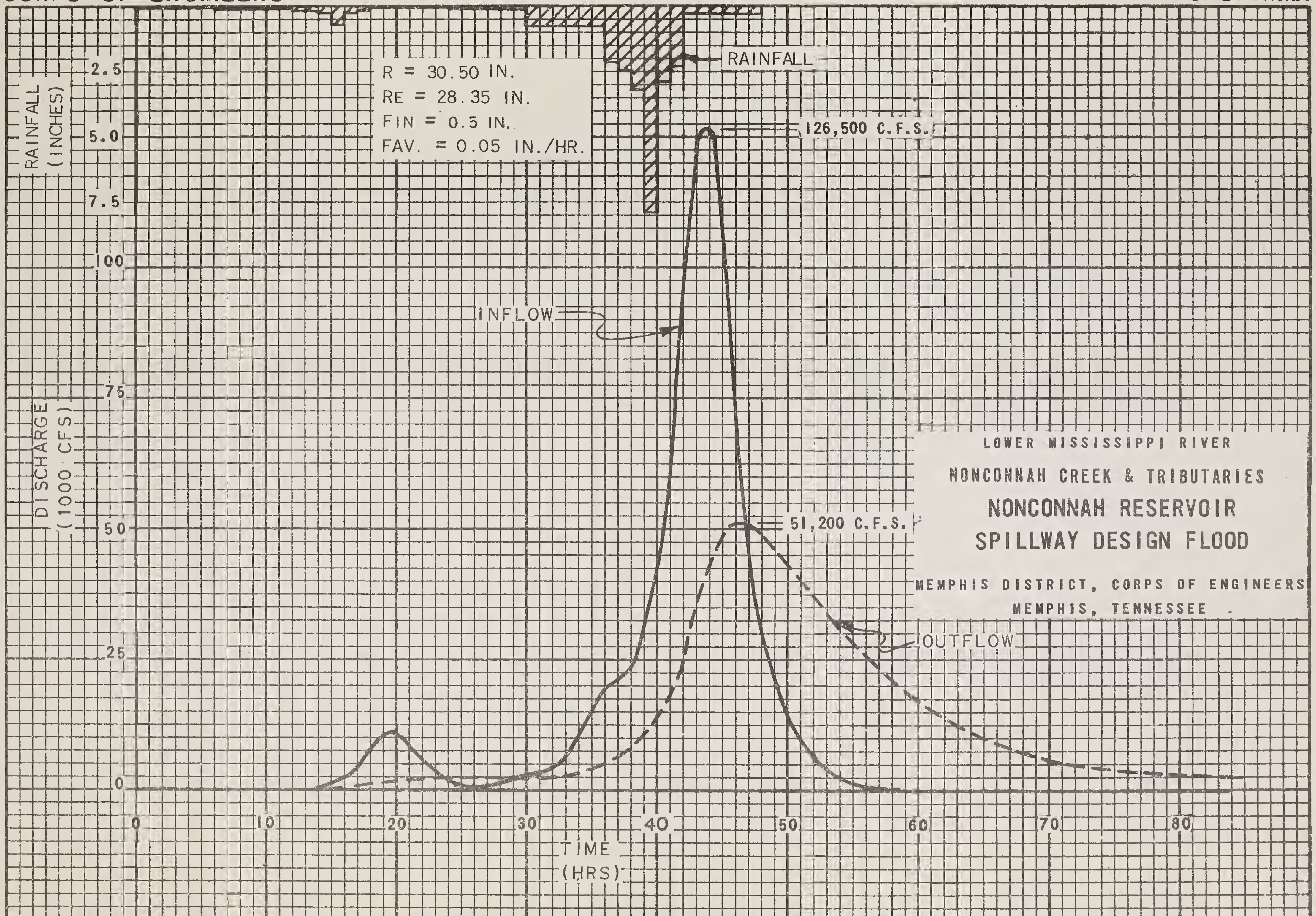
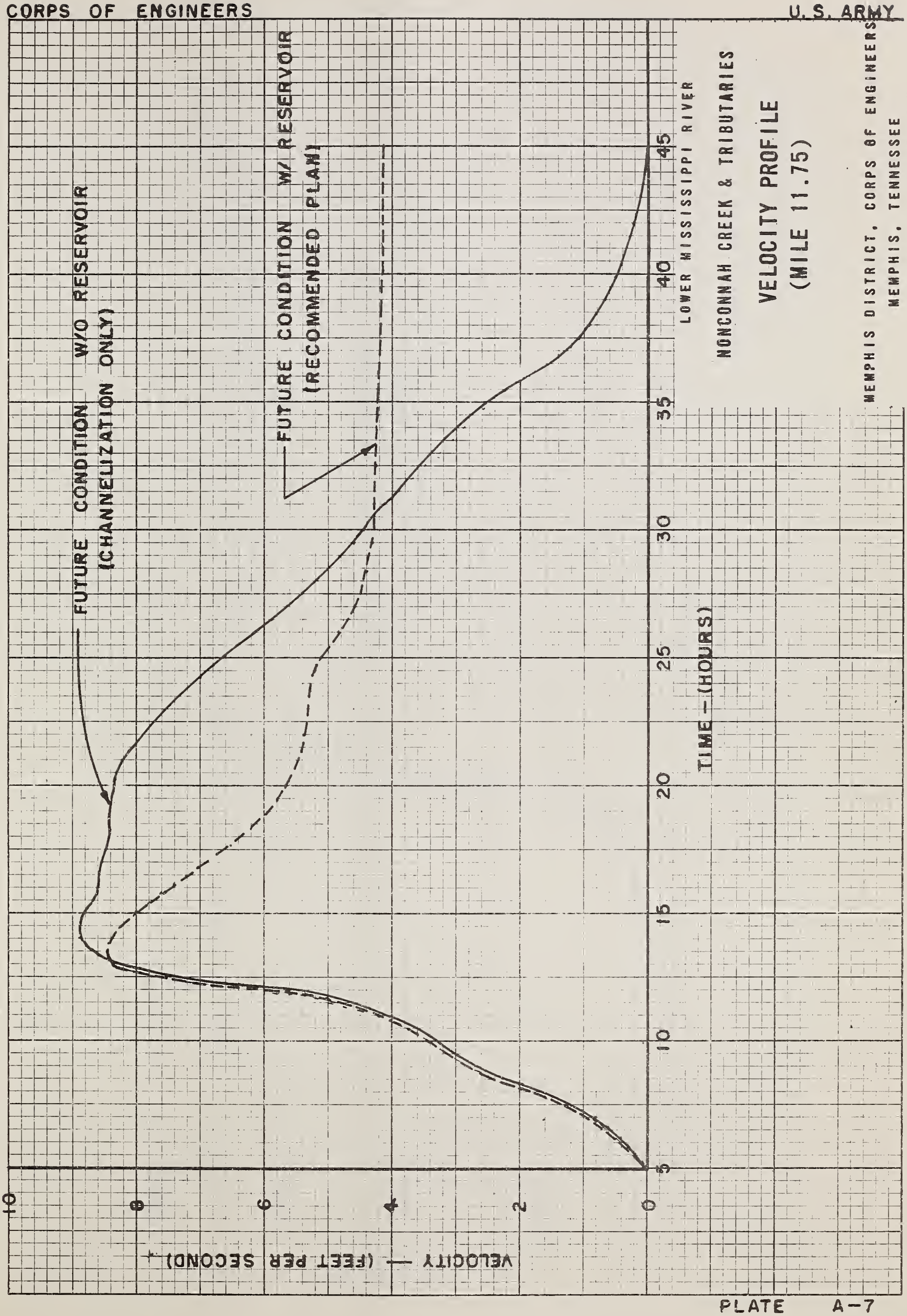
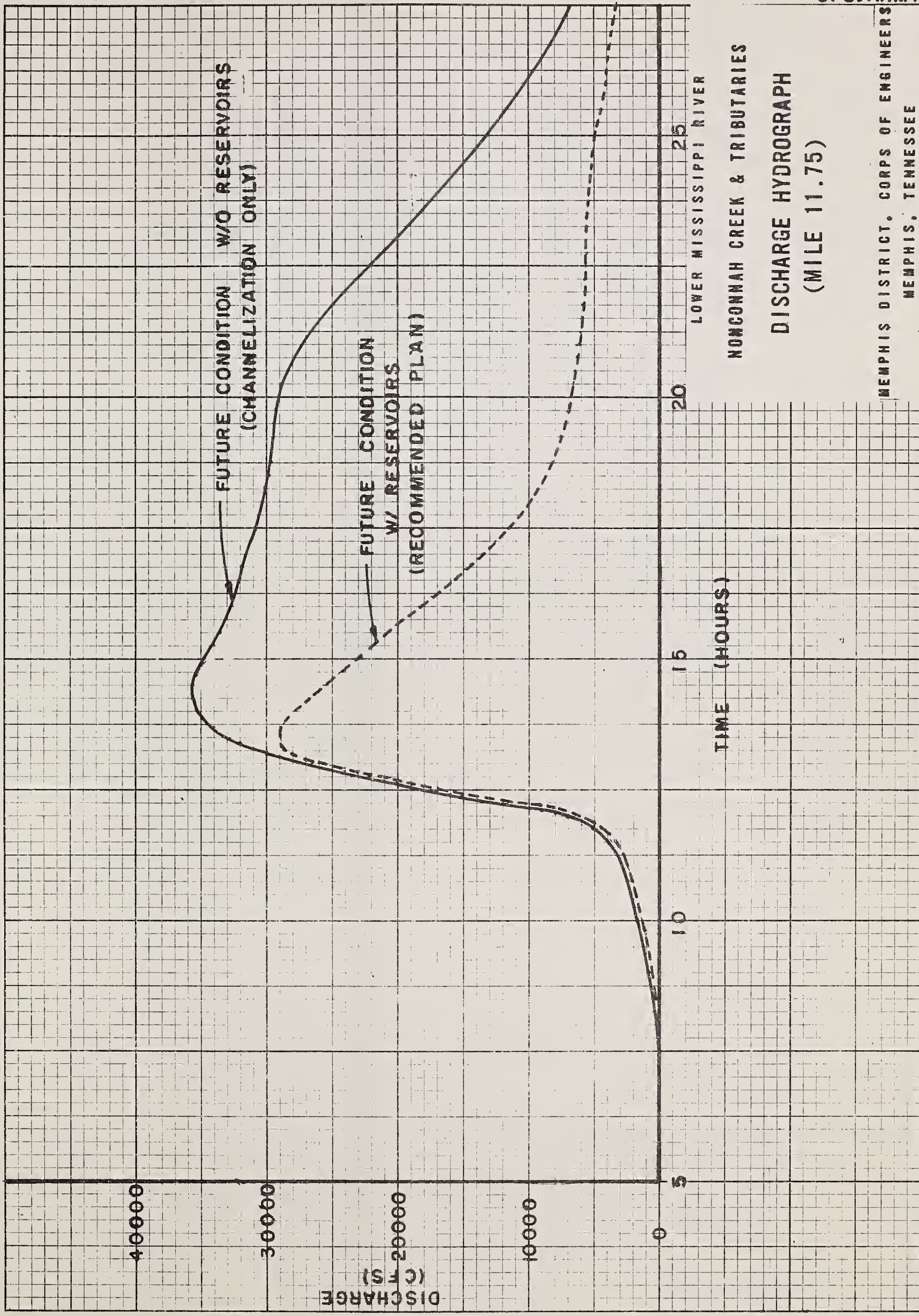


PLATE A-6


LOWER MISSISSIPPI RIVER
NONCONNAH CREEK & TRIBUTARIES
VELOCITY PROFILE
(MILE 11.75)
MEMPHIS DISTRICT, CORPS OF ENGINEERS
MEMPHIS, TENNESSEE
FUTURE CONDITION W/O RESERVOIR
(CHANNELIZATION ONLY)
FUTURE CONDITION W/ RESERVOIR
(RECOMMENDED PLAN)
TIME — (HOURS)
VELOCITY — (FEET PER SECOND)
0
2
4
6
8
10
5
10
15
20
25
30
35
40
45


LOWER MISSISSIPPI RIVER
NONCONNAH CREEK & TRIBUTARIES
DISCHARGE HYDROGRAPH
(MILE 11.75)
MEMPHIS DISTRICT, CORPS OF ENGINEERS
MEMPHIS, TENNESSEE
FUTURE CONDITION W/O RESERVOIRS
(CHANNELIZATION ONLY)
FUTURE CONDITION
W/ RESERVOIRS
(RECOMMENDED PLAN)
TIME (HOURS)
5
10
15
20
25
DISCHARGE
(CFS)
0
10000
20000
30000
40000

CORPS OF ENGINEERS U. S. ARMY

Fold-out Placeholder

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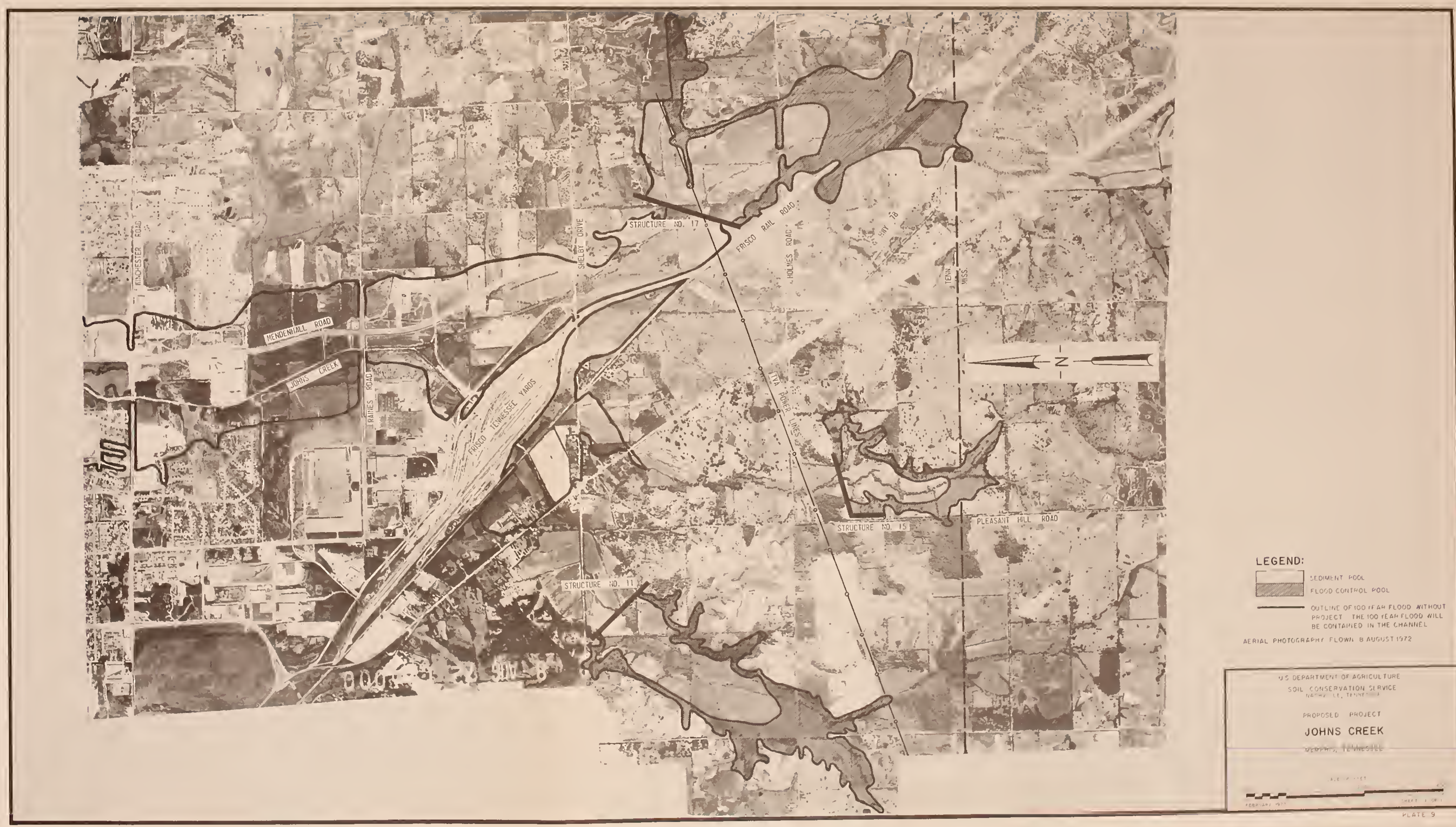
MEMPHIS DISTRICT, CORPS OF ENGINEERS
MEMPHIS, TENNESSEE

DATE: APR 73 SERIAL: 20114 FILE: 209A/42(A-9)

PLATE A-9



STRUCTURE NO. 17
FRISCO RAIL ROAD
HOLMES ROAD
HWY 78
TENN.
MISS.
SHELBY DRIVE
WINCHESTER ROAD
MENDENHALL ROAD
JOHNS CREEK
RAINES ROAD
FRISCO TENNESSEE YARDS
TVA POWER LINES
N
STRUCTURE NO. 15
PLEASANT HILL ROAD
STRUCTURE NO. 11
LEGEND:
SEDIMENT POOL
FLOOD CONTROL POOL
OUTLINE OF 100 YEAR FLOOD WITHOUT PROJECT. THE 100 YEAR FLOOD WILL BE CONTAINED IN THE CHANNEL
AERIAL PHOTOGRAPHY FLOWN 8 AUGUST 1972
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
PROPOSED PROJECT
JOHNS CREEK

PLATE 9

APPENDIX B

ESTIMATES OF FIRST COSTS
AND
ANNUAL CHARGES

PROJECT FEATURES TO BE CONSTRUCTED BY CORPS OF ENGINEERS

INTERIM REPORT

NONCONNAH CREEK BASIN

GENERAL INVESTIGATION STUDIES

APPENDIX B

ESTIMATES OF FIRST COSTS AND ANNUAL CHARGES
PROJECT FEATURES TO BE CONSTRUCTED BY CORPS OF ENGINEERS

1. GENERAL

This appendix presents a summary of detailed cost estimates for project alternatives considered by the Corps of Engineers on the main channel of Nonconnah Creek. Cost estimates for the Soil Conservation Service work shown in the main report were furnished by the Soil Conservation Service and are not included in this appendix.

2. FIRST COSTS

a. General. Costs for construction items are based on recent bids for similar work. Rights-of-way costs are based on land appraisals obtained from recent sales in the area. First costs for recommended plans of improvement have been separated to show Federal, non-Federal, and total project costs.

b. Reservoir Development. Detailed cost estimates were prepared for two plans for construction of the Nonconnah reservoir. Each plan includes flood control storage for the 100-year frequency flood. The recommended plan also includes recreation storage to provide a suitable area and depth for recreation activities on and adjacent to the lake. Table B-1 shows detailed estimates of cost for the Nonconnah reservoir, with and without recreation storage, and local costs computed at 50 percent of the separable cost of providing recreation storage.

c. Nonconnah South Park. Table B-2 shows estimated costs for recreational development recommended on the south side of the lake. This will be a fully developed recreational facility to serve recreational needs of the Memphis and Mid South area. Table B-2 shows estimated costs to be shared 50 percent Federal and 50 percent non-Federal.

d. North Park. Table B-3 shows estimated costs for recreational development recommended on the north side of the proposed lake. This will be primarily a day-use facility to serve urban development areas in the community and will be cost-shared by the local sponsors. Table B-3 shows estimated costs to be shared 50 percent Federal and 50 percnet non-Federal.

e. Channel Improvement. Detailed cost estimates were prepared for several alternative channel designs. Table B-4 shows the cost estimate for the 100-year channel with the proposed Nonconnah reservoir, which is the recommended plan. Table B-6 shows a summary of the cost estimates for the other plans of improvement. The cost of lands needed for the channel improvement are not included in these estimates. The lands will be jointly used for channel improvement and greenway development. Land costs showing Federal and local cost-sharing are shown in Table B-8.

f. Nonconnah Greenway. Table B-7 shows estimated costs for recommended recreation development within the proposed greenway along Nonconnah Creek. These costs will be shared 50 percent Federal and 50 percent local. Estimated cost of lands which will be jointly used for flood control and recreation are shown in Table B-8.

3. ANNUAL CHARGES

Annual charges are based on an annual interest rate of 5-5/8 percent for both Federal and non-Federal costs with amortization of project costs over a 100-year period. Allowances were made for operation and maintenance of projects. Table B-9 summarizes annual charges for project features in the recommended plan. Operation and maintenance costs include allowances for major replacement of cost items as necessary during the 100-year project life.

Table B-1

Cost Estimates
Nonconnah Reservoir
1972 Price Level

Cost Acct No.	Item	Quantity	Unit Cost $	Total $	Estimated Cost wo Recreation Storage $	Separable Cost for Recreation Storage $	Total Federal Cost 100% FC plus 50% Recreation $	Total Local Cost (50% Recreation) $
01	Lands & Damages							
	Agricultural Lands	2,600 ac.	3,500.00	9,100,000	7,350,000	1,750,000	8,225,000	875,000
	Floodplain Lands	2,400 ac.	1,800.00	4,320,000	4,320,000		4,320,000	
	Buildings			225,000	225,000		225,000	
	Crop Damages			250,000	250,000		250,000	
	Relocation of Families			35,000	35,000		35,000	
	Acquistion Costs			105,000	105,000		105,000	
	Subtotal			14,035,000	12,285,000	1,750,000	13,160,000	875,000
	Contingencies	25%		3,500,000	3,100,000	400,000	3,300,000	200,000
	Total Lands & Damages			17,535,000	15,385,000	2,150,000	16,460,000	1,075,000
02	Structural Relocations							
	Shelby Drive Causeway			273,400	273,400		273,400	
	Utility Relocations			90,800	90,800		90,800	
	Bridge Removal			23,100	23,100		23,100	
	Subtotal			387,300	387,300		387,300	
	Contingencies	25%		94,700	94,700		94,700	
	Total Relocation Cost			482,000	482,000		482,000	

Table B-1 (Contd)

Cost Estimates
Nonconnah Reservoir
1972 Price Level

Cost Acct No.	Item	Quantity	Unit Cost $	Total $	Estimated Cost wo Recreation Storage $	Separable Cost for Recreation Storage $	Total Federal Cost 100% FC Plus 50% Recreation $	Total Local Cost (50% Recreation) $
02.3	Cemetery Relocation							
	Relocation Site	2 ac.	3,500.00	7,000	7,000		7,000	
	Acquistion Costs			5,000	5,000		5,000	
	Grave Relocation	200 graves	200.00	40,000	40,000		40,000	
	Subtotal			52,000	52,000		52,000	
	Contingencies	25%		13,000	13,000		13,000	
	Total Cemetery Relocation			65,000	65,000		65,000	

Table B-1 (Contd)

Cost Estimates
Nonconnah Reservoir
1972 Price Level

Cost Acct No.	Item	Quantity	Unit Cost $	Total $	Estimated Cost wo Recreation Storage $	Separable Cost for Recreation Storage $	Total Federal Cost 100% FC plus 50% Recreation $	Total Local Cost (50% Recreation) $
03	Structural Costs							
	Clearing & Grubbing	141 Ac.	400.00	56,400	56,400		56,400	
	Embankment	1,400,000 CY	0.55	770,000	675,300	94,700	722,650	47,350
	Excavation	2,440,000 CY	0.30	732,000	732,000		732,000	
	Impervious Fill	80,000 CY	0.60	48,000			48,000	
	Riprap	42,700 CY	13.00	555,000	479,000	76,000	517,000	38,000
	Gravel	15,900 CY	10.00	159,000	137,200	21,800	148,100	10,900
	Sand Filter	67,000 CY	6.25	418,800	361,400	57,400	390,100	28,700
	Access Road	25 Sta	100.00	2,500	2,500		2,500	
	Gravel Surfacing	6,400 CY	7.00	44,800	44,800		44,800	
	Dbl. Bit. Surfacing	24,000 SY	1.00	24,000	24,000		24,000	
	Topsoil	11,500 CY	1.00	11,500	9,900	1,600	10,700	800
	Concrete Paving	400 CY	65.00	26,000	26,000		26,000	
	Fertilizing, Sodding & Mulching	77 Ac.	430.00	33,000	28,500	4,500	30,750	2,250
	Dewatering	Job		36,000	36,000		36,000	
	Outlet & Gates			1,082,000	1,082,000		1,082,000	
	Spillway Construction			2,301,000	2,301,000		2,301,000	
	Subtotal			6,300,000	6,044,000	256,000	6,172,000	128,000
	Contingencies	25%		1,575,000	1,511,000	64,000	1,543,000	32,000

Table B-1 (Contd)

Cost Estimates
Nonconnah Reservoir
1972 Price Level

Cost Acct No.	Item	Quantity	Unit Cost	Total	Estimated Cost wo Recreation Storage	Separable Cost for Recreation Storage	Total Federal Cost 100% FC plus 50% Recreation	Total Local Cost (50% Recreation)
			$	$	$	$	$	$
	Total Structural Costs			7,875,000	7,555,000	320,000	7,715,000	160,000
	Total Construction Cost			25,957,000	23,487,000	2,470,000	24,722,000	1,235,000
30	Engineering & Design			676,000	609,000	67,000	642,500	33,500
31	Supervision & Administration			630,000	567,000	63,000	598,500	31,500
	Total Project Cost			27,263,000	24,663,000	2,600,000	25,963,000	1,300,000
	Percent Cost Distribution						95%	5%

Table B-2

Cost Estimate
Nonconnah Reservoir South Park
1972 Price Level

Cost Acct No.	Item	Total Costs $
01	Land acquisition, 700 ac. @ $3,500/acre	2,450,000
14	Tent & trailer camping, 300 sites @ $3,500/site	1,050,000
14	Boat docks & parking	100,000
14	Boat launch ramps with parking, 2 @ $25,000 ea.	50,000
14	Interpretive Center	60,000
14	All weather group camp	300,000
14	Picnic sites, 120 @ $1,000/unit	120,000
14	Shelters, 3 @ $15,000 ea.	45,000
19	Restrooms, 3 @ $15,000 ea.	45,000
14	Game fields:	175,000
	4 Ball fields, lighted	
	4 Tennis courts, lighted	
	1 Croquet area, lighted	
	5 Horseshoe playing units	
	1 Combination concession & restroom bldg.	
	150 parking spaces	
14	Trails, 10 mi. @ $1,500/mi.	15,000
08	Roads, 2 miles	100,000
19	Utilities, sanitary, water, electricity	400,000
14	Landscaping, planting trees, grassing	100,000
	Subtotal	5,010,000
	Contingencies @ 25%	1,253,000
30	Engineering & Design	110,000
31	Supervision & Administration	120,000
	Subtotal	6,493,000
	Non-Federal costs @ 50%	3,246,500
	Federal costs @ 50%	3,246,500
	Total	6,493,000

Table B-3

Cost Estimate
Nonconnah Reservoir North Park
1972 Price Level

Cost Acct No.	Item	Total Costs $
01	Real estate costs, 120 ac. @ $3,500	420,000
14	Picnic shelters, 3 @ $15,000 ea.	45,000
14	Picnic Units, 100 @ $1,000 per unit (includes table, cooker, trash receptacle, etc.)	100,000
14	2-Lane boat launching ramp with 50 car & trailer parking lot	50,000
14	Develop 40 acres of playfields, required parking, one area to be lighted	65,000
14	Trails, 2 mi @ $1,500/mi	3,000
14	Paved game areas: 5 Tennis courts, lighted 2 Basketball courts, lighted 2 Volleyball courts Required parking	70,000
19	Combination restroom change shelters 3 @ $25,000 ea.	75,000
08	15,000 feet of access road @ $100,000 per mile	285,000
19	Utilities - sanitary, water, electricity	250,000
14	Landscaping	100,000
	Subtotal	1,463,000
	Contingencies @ 25%	362,000
	Subtotal	1,825,000
30	Engineering & Design	75,000
31	Supervision & Administration	76,000
	Subtotal	1,976,000
	Federal cost @ 50%	988,000
	Non-Federal cost @ 50%	988,000
	Total	1,976,000

Table B-4

Cost Estimate

Nonconnah Channel Improvement
Recommended Plan
(Does not include land costs)
1972 Price Level

Cost Acct No.	Item	Federal Cost $		Non-Federal Cost $
09	Channel Work:			
	Selective clearing	283,500		
	Excavation	1,116,500		
	Dressing, fertilizing & seeding	304,000		
	Channel protection at bridges 1/	2,342,000		
	Channel protection between bridges and @ channel bends	1,046,000		
02	Relocations:			
.1	Roads and bridges 1/			230,000
.2	Railroad bridges 1/	650,000		
.3	Utilities			400,000
	Subtotal	5,742,000		630,000
	Contingencies @ 25%	1,435,200		157,400
	Subtotal	7,177,200		787,400
30	Engineering & Design	533,800		54,600
31	Supervision & Administration	595,500		66,500
	Subtotal	8,306,500		908,500
	Total		9,215,000	

1/ Detailed Estimate shown on table B-5

Table B-5

Cost Estimate
Bridge Alterations and Channel Protection at Bridges

Location (mile)	Facility	Bridge Alterations Description	Cost $	Channel Protection Riprap Thickness	Cost $
1.70	Horn Lake Road	Piers, Nosings	119,500	27"	147,500
2.02	U.S. 61	Nosings, curtain walls	5,800	21"	186,000
2.10	Railroad Br	Piers and trestle	630,000	30"	183,000
2.58	Railroad Br	Reconstruct 1 bent	20,000	24"	123,000
4.10	I-55 Ramp	None	-0-	24"	231,000
4.30	I-55 Ramp	None	-0-	24"	236,000
4.32	U.S. 51	Nosings, curtain walls	36,700	Concrete	180,000
6.5	Nonconnah Corp. Br	Nosings, curtain walls	29,000	27"	103,000
6.60	I-240 Ramp	None	-0-	27"	143,500
6.64	Airways Br	Nosings	7,000	24"	132,500
6.68	I-240 Ramp	None	-0-	24"	153,500
8.33	Railroad Br	None	-0-	24"	119,000
8.72	Lamar Ave	None	-0-	30"	177,000
9.98	Getwell Rd.	Nosings, curtain walls	16,000	24"	117,500
11.37	Perkins Rd.	Nosings, curtain walls	16,000	21"	109,500
		Total	880,000		2,342,000

Table B-6

Cost Estimate

Alternative Design
Nonconnah Channel Improvement
1972 Price Level

Project Alternative	Excavation 1,000 CY	Excavation Cost $	Clearing $	Dressing, Fertilizing Soding, and Seeding Acre	Dressing, Fertilizing Soding, and Seeding Cost $	Channel Paving	Riprap Bank Protection $	Structural Relocations $	Subtotal $	Con-tingencies at 25% $	Total Construction Cost $	E&D	S&A	Total Installation Cost $	Right of Way	Total First Cost
Plan No. 1: Earth Channel to Johns Creek without Nonconnah Lake																
100-year design	2,677	1,338,500	300,300	878	307,300	-	3,588,000	1,300,000	6,834,100	1,708,500	8,542,600	634,600	713,800	9,891,000	5,480,000	15,371,000
Plan No. 2: No Channel Improvement	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Plan No. 3: Earth Channel to Johns Creek with Nonconnah Lake																
25-year design	1,334	667,000	224,400	761	266,300	-	2,908,000	1,200,000	5,265,700	1,316,400	6,582,100	477,800	537,100	7,597,000	5,480,000	13,077,000
100-year design	2,233	1,116,500	283,500	869	304,000	-	3,388,000	1,280,000	6,372,000	1,592,600	7,964,600	588,400	662,000	9,215,000	5,480,000	14,695,000
200-year design	2,867	1,433,500	305,600	880	308,000	-	3,578,000	1,360,000	6,985,100	1,746,300	8,731,400	649,700	730,900	10,112,000	5,480,000	15,592,000

Table B-6 (Contd)

Cost Estimate

Alternative Design
Nonconnah Channel Improvement
1972 Price Level

Project Alternative	Excavation 1,000 Cy	Excavation Cost $	Clearing $	Dressing, Fertilizing Soding, and Seeding Acre	Dressing, Fertilizing Soding, and Seeding Cost $	Channel Paving	Riprap Bank Protection $	Structural Relocations $	Subtotal $	Con-tingencies at 25% $	Total Construction Cost $	E&D $	S&A $	Total Installation Cost $	Right of Way	Total First Cost
Plan No. 4: Earth Channel to Mile 19.8 without Noconnah Lake																
100-year design	5,282	2,641,000	730,500	1,687	573,000	-	3,688,000	1,400,000	9,032,500	2,258,500	11,291,000	855,000	962,000	13,108,000	10,730,000	23,838,000
Plan No. 5:	(Channel Design same as Plan 4 above)															
Plan No. 6:	(Channel Design same as Plan 3 above)															
Plan No. 7: Channel to Johns Creek with 1 on 12 side slopes and Paved Invert	6,666	3,333,000	291,600	743	260,000	12,770,000	1,204,000	1,280,000	19,138,600	4,784,400	23,923,000	1,794,000	2,830,000	28,547,000	8,363,000	36,910,000

Table B-6 (Contd)

Cost Estimate

Alternative Design
Nonconnah Channel Improvement
1972 Price Level

Project Alternative	Excavation 1,000 CY	Excavation Cost $	Clearing $	Dressing, Fertilizing Soding, and Seeding Acre	Dressing, Fertilizing Soding, and Seeding Cost $	Channel Paving	Riprap Bank Protection $	Structural Relocations $	Subtotal $	Con-tingencies at 25% $	Total Construction Cost $	E&D $	S&A $	Total Installation Cost $	Right of Way	Total First Cost
Plan No. 8: Paved Channel to Johns Creek without Nonconnah Lake	1,200	756,000	340,800	920	520,900	37,510,500	-	-	39,128,200	9,871,800	49,000,000	3,000,000	5,000,000	57,000,000	3,000,000	60,000,000
Plan No. 9: Paved Channel to John Creek & Earth Channel to Mile 19.8	3,800	2,058,5[illegible]	771,000	1,730	786,600	37,510,500	100,000	100,000	41,326,600	10,331,400	51,658,000	3,237,000	5,355,000	60,250,000	8,250,000	68,500,000
Plan No. 10: Paved Channel to Mile 19.8	1,880	1,185,900	534,100	1,440	816,500	58,783,500	-	-	61,320,000	15,330,000	76,650,000	4,600,000	7,750,000	89,000,000	4,000,000	93,000,000

Table B-7

Cost Estimate

Nonconnah Greenway Recreation Development
1972 Price Level

Cost Acct No.	Item	Total Costs $
14	20 Miles of hiking trails @ $1,500 per mile, 4 feet wide, graded earth with markers	30,000
14	20 Miles of bicycle trails @ $3,000 per mile, 6 feet wide, soil cement	60,000
14	10 Miles of horse trails @ $3,000 per mile, 8 feet wide, graded earth with markers	30,000
14	25 Picnic units @ $1,000 per unit, includes table, cooker, trash receptable, etc.	25,000
14	5 Picnic shelters/rest shelters @ $15,000	75,000
14	10 Foot-bridges @ $3,500 each	35,000
14	Drinking water, fountains	45,000
14	Landscaping, 1,000 acres @ $100 per acre	100,000
19	5 Small restrooms @ $20,000 each	100,000
19	5 Parking areas, 25 spaces each	50,000
	Subtotal	550,000
	Contingencies @ 25%	137,000
	Subtotal	687,000
30	Engineering & Design	40,000
31	Supervision & Administration	45,000
	Subtotal	772,000
	Federal Cost @ 50%	386,000
	Non-Federal Cost @ 50%	386,000
	Total	772,000

Table B-8

Cost Estimate

Real Estate Costs - Nonconnah Greenway
1972 Price Level

Cost Acct No.	Item	Unit Cost $	Total Cost $	Federal $	Local Cost $
.01	Lands specifically needed for:				
	Channel Improvement:				
	550 Acres	8,000	4,400,000		4,400,000
	Relocation of owners		22,000		22,000
	Acquisition costs		4,000		4,000
	Subtotal		4,426,000		4,426,000
	Contingencies @ 25%±		1,054,000		1,054,000
	Total		5,480,000		5,480,000
.01	Lands to be developed as greenway:				
	335 acres	8,000	2,680,000	1,340,000	1,340,000
	515 acres	3,000	1,545,000	772,500	772,500
	Relocation of owners		33,000	16,500	16,500
	Acquisition costs		6,000	3,000	3,000
	Subtotal		4,264,000	2,132,000	2,132,000
	Contingencies @ 25%±		986,000	493,000	493,000
	Subtotal		5,250,000	2,625,000	2,625,000
	Project cost		10,730,000	2,625,000	8,105,000
	Percent cost distribution		100%	25%	75%

Table B-9

ANNUAL CHARGES FOR WORK PROPOSED BY THE CORPS OF ENGINEERS

		Federal Costs			Non-Federal Costs			Total
Project Feature	First Cost	Interest	Amortization	Operation & Maintenance	Interest	Amortization	Operation & Maintenance	Annual Charges
	$	$	$	$	$	$	$	$
Nonconnah Reservoir	27,263,000	1,460,400	6,200	150,000	73,100	300	0	1,690,000
North Park	1,976,000	55,600	200	0	55,600	200	20,000	131,600
South Park	6,493,000	182,600	800	0	182,600	800	120,000	486,800
Channel Improvement	9,215,000	467,200	2,000	0	51,100	200	416,000	936,500
Greenway Lands	10,730,000	147,700	600	0	455,900	1,900	0	606,100
Greenway Development	772,000	21,700	100	0	21,700	100	80,000	123,600
TOTAL	56,449,000	2,335,200	9,900	150,000	840,000	3,500	636,000	3,974,600

1972 Price Level

APPENDIX C

ECONOMICS

PROJECT FEATURES TO BE CONSTRUCTED BY CORPS OF ENGINEERS

INTERIM REPORT

NONCONNAH CREEK BASIN

GENERAL INVESTIGATION STUDIES

APPENDIX C

ECONOMICS

PROJECT FEATURES TO BE CONSTRUCTED BY CORPS OF ENGINEERS

1. INTRODUCTION

a. Purpose. The purpose of this appendix is to present population and land use data for the study area, inventory water resource needs, present the benefits and costs of the recommended plan of improvement and discuss the alternative plans considered.

b. General. The appendix is laid out in seven major sections. Section 2 describes population and land use; Section 3 outlines needs of the area; Sections 4, 5, and 6 discuss the benefits, costs and benefit to cost ratio of the recommended plan; and Section 7 describes study methodology.

2. POPULATION AND LAND USE

a. General. The Nonconnah Creek watershed covers an area of 117,300 acres. Eighty-one percent or 94,960 acres are in Shelby County, Tennessee; 730 acres or 0.6 percent are in Fayette County, Tennessee; 12,300 acres or 10.5 percent are in DeSoto County, Mississippi; and 9,300 acres or 7.9 percent of the basin acreage are in Marshall County, Mississippi. The basin is elongated in shape extending 32 miles from its headwaters in the state of Mississippi to its outlet into McKellar Lake on the Mississippi River in Tennessee. At its maximum width, it is about 10 miles wide. Land use in the headwater area is devoted to agricultural pursuits while in the lower reaches land areas are devoted to urban uses. The lower 15 miles of the creek flow through the present city limits of the city of Memphis, Tennessee.

b. Growth of the Area.

(1) Memphis and Shelby County. The city of Memphis began as a river port on the banks of the Mississippi River. The Chickasaw Bluffs upon which the original settlement was built provided security from the annual high water experienced on the river. The city has continued to grow and is currently the largest on the river between St. Louis and New Orleans. Its port handles more tonnage than any other along the Mississippi from St. Louis to Baton Rouge. Its geographic position and excellent transportation facilities have made it the primary service distribution center for the entire Mid-South area.

As the city grew, it spread out towards the east. Expansion was hindered on the north by the Wolf River and on the south by Nonconnah Creek. Plates C-1 and C-2 illustrate the special form the growth process has manifested.

In 1920, Memphis had a population of 162,000 people and urban development had extended from the Wolf River on the north to Nonconnah Creek on the south. By 1930, the population had surpassed 250,000 and most of the new urbanization was occurring eastward. The streetcar and the railroad played the dominant role in the transportation of commuters between place of work and residence. This transportation system radiated eastward from the river and tended to encourage growth eastward. After World War II, the automobile replaced rails as the dominant commuter transport mode and highway location became a major influence on spatial form and urbanization of the area. By 1950, the Memphis population was approaching 400,000 and development was extending across the floodplain barriers of Wolf River and Nonconnah Creek. Plate C-3 shows present distribution of population density.

Table C-1

Population of the City of Memphis and the County of Shelby, Historical and Projected, 1900-1990

Year	Population	
	Memphis 1/	Shelby County
1900	102,320	153,557
1910	131,105	191,439
1920	162,351	223,216
1930	253,143	306,216
1940	292,942	358,250
1950	396,000	482,393
1960	497,524	627,019
1970	623,530	722,014
1980	753,700	841,900
1990	877,480	995,930

1/ Projection is for urbanized area of county.

Source: Historical, Census of Population; Projected, Memphis and Shelby County Planning Commission. The population growth for the urbanized area shows a 40.7% increase between the year 1970 and 1990 whereas the OBERS Projections, U.S. Water Resources Council, Wash. D.C. 1972 shows a 35.1% increase for the Memphis SMSA for this same period. The Memphis SMSA includes a larger area and the urbanized portion is expected to grow at this slightly increased rate relative to the total SMSA of which it is only a part.

The Memphis and Shelby County Planning Commission anticipates a population of nearly one million people by 1990.

(2) Nonconnah Creek. As distances from the central business district (CBD) to the fringe of urban development increased, the advantages of closer proximity in the form of transit time and money saving became sufficient to make the floodplain of Nonconnah Creek an economically attractive site to locate commercial and residential structures even after discounting the extra expenses incurred for land fill to comply with local zoning ordinances.

Prior to the Soil Conservation Service Floodplain Information Report of 1968, local zoning policy required land fill elevated to the flood of record plus a safety factor of 1-1/2 feet. Since the 1968 report, policy has been to require fill to 1-1/2 feet above the 1937 flood in the area subject to Mississippi backwater. In the area subject to headwater flooding fill is required to the 100-year flood elevation profile under present conditions as shown in the 1968 report.

The completion in 1963 of Interstate Highway 240 (I-240), the southern leg of the circumferential through the floodplain has greatly accelerated development there. Plate C-4 showing percentage of floodplain area development against time provides visual evidence of this effect. Most of the recent development below U. S. Highway 78 (Lamar Avenue) has been commercial while development above Lamar Avenue has been residential. Many new residential subdivisions containing both single and multiple unit structures are being built within the floodplain on the eastern edge of the city and into the county.

As of 1970, the basin contained 302,200 people, all but 4,000 of which lived in the Shelby County portion. Sixty-eight percent of the population was white with 32 percent non-white. Median family income in the Shelby County portion ranged from a low of $5,000 to a high of $23,000 per census tract.

About 13,800 of basin's inhabitants live within the floodplain as defined by the 100-year flood. Value of improvements within the floodplain are estimated to be $135 million of which $55 million are residential and $80 million are commercial type improvements.

3. NEEDS OF THE AREA

a. Flood Control Needs.

(1) Past Floods. The most recent major flooding occurred in 1958. At that time most of the area was used for agricultural production or was undeveloped open space; however, dozens of homes were flooded and at least 125 persons were evacuated from the area. The damage was estimated in the thousands of dollars.

Since 1958, the floodplain has been developed for commercial and residential use. If a flood with the same water surface elevations as the 1958 flood occurred today, it is estimated that 130 homes would be inundated above flood levels. In addition, 200 apartment units and 25 business establishments would suffer damage. Some 2,000 persons would be affected and dollar damage from a storm of this magnitude would run into the millions. Property damage from a 100-year frequency flood under existing conditions of development and basin runoff would be much greater than the 1958 flood and is estimated at $13.1 million.

(2) Future Floods. The average annual potential flood damage under existing economic and hydrologic runoff conditions (1970-71) have been estimated. Potential average annual damages are based on a summary of the mathematical probability of all floods up to and including the 200-year flood occurring in a single year.

Flood damage estimates provide a measure of flood control needs. Tangible flood damages are those which can readily be assigned monetary values while intangible flood damages are those which are extremely difficult to assign monetary value.

Tangible flood damages can be subdivided into three classes: (1) physical, (2) emergency costs, and (3) business and financial losses. Physical flood damages include such things as damage to or loss of structures, loss of contents including furnishings, equipment and inventories, and cost of clean up. Emergency costs include those additional expenses resulting from a flood that would not otherwise be incurred, such as evacuation and reoccupation, and the increased costs of local government services during the flooding. Business and financial losses include various economic losses other than physical damages and emergency costs resulting from a flood such as net loss of normal profit and earnings to capital, management and labor in the readily identifiable zone of flood influence.

Physical flood losses relate to flood damages to the following classes of properties: (a) urban residential, (b) urban commercial, (c) public facilities including highways, bridges, railroads, storm sewers, etc., and (d) agricultural.

Table C-2 displays a summary of estimated average annual damages attributable to flooding on the main stem of Nonconnah Creek under existing conditions.

Table C-2

Estimated Average Annual Flood Damages
Under Existing Conditions

Damage Category	Average Annual Damage
Agricultural	$ 6,300
Residential	917,100
Commercial	125,300
Public Facilities	17,800
Total Physical Damage	$1,066,500

Other tangible damages which have not been calculated on an average annual basis include emergency costs and business and financial losses. Estimates for a one time occurrence of the 100-year flood indicate that emergency costs would be on the order of $166,000 and business and financial losses about $132,000. Project data was not available in sufficient detail to estimate with confidence an average annual value; however, an average annual figure of $4,500 for emergency costs and $3,600 for business and financial losses seems reasonable.

b. Recreation Needs. Evidence to demonstrate needs for recreation facilities in the study area is readily available. Three independent studies are cited, each of which concludes that recreation needs of the type to be provided for in the recommended plan do exist.

(1) Tennessee Comprehensive Outdoor Recreation Plan, 1969. Region 8 in the report includes 12 counties in the southwest part of the state including the metropolitan area of Memphis. The plan states:

> In terms of number of resources and facilities showing need, Region 8 has the greatest needs. No facilities show idle capacity. In seven activities, Region 8 is short more than one million activity occasions. The largest deficit by far is in playing outdoor games, which shows a 1967 need of more than nine million activity occasions. The 1967 swimming need is more than eight million occasions; fishing, more than five million; boating, more than five million; picnicking, three million; horseback riding, one million; and small game hunting, one million. 1/

(2) Bureau of Outdoor Recreation Study. The Bureau of Outdoor Recreation did an interim demand, supply, and needs study for outdoor recreation in the Chickasaw-Hatchie River basins, an area which contains part or all of ten of the 12 counties contained in Region 8 of the state of Tennessee plan.

1/ Tennessee Statewide Comprehensive Outdoor Recreation Plan, 1969. Division of Planning, Tennessee Department of Conservation. p. 298.

These results for water-oriented outdoor recreation were published in the USDA report Chickasaw-Metropolitan Surface Water Management Survey Report, 1971 and are reproduced here. These statistics show a need to provide for more recreation occasions in boating, swimming, camping, picnicking and fishing.

The Bureau of Outdoor Recreation study shows a need to provide opportunities for 3.2 million activity occasions in boating, swimming, camping, and picnicking and 1.5 million man-days of fishing by the year 1980.

Table C-3

Water-oriented outdoor recreation demand, supply, and needs, present and projected
Chickasaw-Hatchie River Basins

Year and Activity	Activity Occasions Demand	Supply	Needs
1960			
Fishing 1/	1,272,767	304,501	968,266
1965			
Boating	1,394,600	708,500	686,100
Swimming	1,545,800	1,779,200	-
Camping	369,700	134,000	235,700
Picnicking	1,999,500	894,000	1,105,500
Total	5,309,600	3,515,700	2,027,300
1980			
Boating	1,767,900	708,500	1,059,400
Swimming	1,959,600	1,779,200	180,400
Camping	468,600	134,000	334,600
Picnicking	2,534,700	894,000	1,640,700
Total	6,730,800	3,515,700	3,215,100
Fishing	1,845,340	304,501	1,540,339
2000			
Boating	2,307,400	708,500	1,598,900
Swimming	2,557,600	1,779,200	778,400
Camping	611,600	134,000	477,600
Picnicking	3,308,200	894,000	2,414,200
Total	8,784,800	3,515,700	5,269,100
Fishing	2,736,982	304,501	2,432,481
2020			
Boating	3,077,500	708,500	2,369,000
Swimming	3,411,200	1,779,200	1,632,000
Camping	815,700	134,000	681,700
Picnicking	4,412,300	894,000	3,518,300
Total	11,716,700	3,515,700	8,201,000
Fishing	3,983,091	304,501	3,678,590

1/ Fishing usage is expressed in man-days and applies only to Chickasaw Basin.

Source: USDA Chickasaw - Metropolitan Surface Water Management Survey Report 1971.

(3) Parks, Recreation and Conservation Plan for Memphis and Shelby County. This plan by the Memphis and Shelby County Planning Commission first published in 1965 and revised in 1972 shows need for an additional 30,000 acres of park and open space land to be acquired and developed by 1990 to meet the needs of the residents of Memphis and Shelby County. Of this total, 2,050 acres are needed for large urban parks, 14,132 acres for regional parks and 13,000 acres for greenbelts.

The plan recommends a system of greenbelts be provided along major rivers and creeks throughout the county which in addition to providing flood protection could be developed with a system of trails and areas for picnicking and camping.

4. BENEFITS OF THE RECOMMENDED PLAN

a. General. The recommended plan of improvement calls for a multiple purpose reservoir providing flood control and recreation storage on the main stem of Nonconnah Creek at approximately mile 20 from the mouth. Recreation pool surface would be 1,900 acres. Park facilities would be developed on the north and south shores.

Channel enlargement would extend from mile 0.7 to mile 11.8 near the confluence of Johns Creek. The channel, in combination with a 600-foot floodway, would have capacities to carry the 100-year flood.

A 600-foot greenway will extend from the dam site to the mouth of Nonconnah Creek serving as a floodway during infrequent floods and a recreation area during the remaining time. It would be fully developed with a system of trails and other recreation facilities. It would also provide a buffer zone of open space separating intensive commercial and residential development on either side of the creek.

b. Flood Damage Reduction Benefits. Flood damage reduction benefits are measured as the difference between the estimated average annual flood damages without the project and those residual average annual flood damages with the project. In order to determine these benefits, it is necessary to estimate base year and future potential flood damages both with and without project conditions. Future damages must then be discounted back to the base year.

In a floodplain which is developing as rapidly as the Nonconnah, it is difficult to estimate future flood damage potential. We can be absolutely certain about the direction of change, but the exact magnitude of change may be subject to a large statistical error. Flood damage potential is certain to become more severe for two important reasons.

First, as more area of the floodplain is developed into commercial and residential use, property value in constant dollar terms subject to damage increases. Second, as the watershed becomes urbanized, runoff from any given size storm increases because more impervious surface area is created in the urbanization process. Increased runoff increases the depth of flooding and the area subject to overflow within the floodplain.

For this survey report, flood damages with and without the project were estimated for three points in time under different economic and hydrologic conditions: existing (1970-71) conditions, base year (1980) conditions, and future (2000) conditions.

Table C-4

Summary of Average Annual Flood Damages and Benefits
Nonconnah Creek Flood Plain Only

	Economic & Hydrologic Condition			Base Year Plus Discounted Future Value
	Existing (1970-71) $	Base Year (1980) $	Future (2000) $	$
Damage without project	1,066,500	3,133,500	5,115,000	4,369,100
Damage with project	3,200	11,500	63,200	43,700
Damage reduction benefits (1-2)	1,063,300	3,122,000	5,051,800	4,325,400

Price level: 1972

By 1980, average annual flood damages will reach $3,133,500 without providing for flood control. With the features of the recommended plan installed, these damages are reduced to $11,500 annually. The reduction in flood damages under the with and without project conditions serve as a measure of flood damage reduction benefit, in this case $3,122,000 for the year 1980. Full development of the floodplain below the dam site is anticipated by the year 2000. The estimated damage with and without is shown under the column "Future for Year 2000." Future damage is increased because more of the floodplain will be occupied by structures and flooding will be more severe because of increased runoff due to urbanization of the watershed. The change in hydrologic conditions reflects approximately 75% of the very significant increase in average annual damages during the period 1970-71 to 2000. Approximately 5% of the change is estimated to accrue as a result of additional

It is probable that these and additional regulations on floodplain use will be effected in future years, reducing the extent of increased damages due to additional development within the floodplain.

The present worth (1980) of the future damages and benefits discounted at 5-5/8 percent and converted to an average annual equivalent over the period of analysis 1980-2000 is added to the base year estimate of damages and benefits as shown in Table C-4, Column 5.

c. Recreation Benefits. Three separate recreation components are included in the recommended plan: (1) a fully developed park on the south shore of the reservoir containing a minimum of 700 acres with facilities for day and overnight use; (2) a 120-acre day use park on the north shore of the reservoir to be developed in cooperation with the local sponsor; and (3) a greenway developed along the creek containing day use facilities for hiking, biking, and picnicking. The greenway-floodway gross acreage will contain about 1,470 acres.

(1) South Park. This park will contain a 300-unit campground, picnic and game facilities. Annual visitation is estimated at 600,000 based on facility carrying capacity. Any usage above this figure will degrade the recreation experience.

(2) North Park. The north park area will be developed for intensive day use to complement the south park. It will include picnic, game, and swimming areas as well as a boat launching facility. Annual visitation is estimated to be 350,000.

(3) Greenway Development. The greenway will extend as a continuous strip along the creek from the south park adjacent to the reservoir down to the mouth. The greenway will serve as a floodway for infrequent floods and be developed for day use with a system of trails and picnic facilities. Recreation opportunities will include hiking, bicycling, nature walks, and picnicking. There is great potential to develop the greenway as a linear urban park connecting the Nonconnah Reservoir South Park with the 1,000-acre T. O. Fuller State Park and the city's 388-acre Dr. Martin Luther King Riverside Park, both of which are located adjacent to McKellar Lake at the mouth of Nonconnah Creek.

The greenway facilities will be readily accessible to the inner city poor and other lower income groups in Memphis. Census tracts 53, 55, 56, and 78 lie along the north side of Nonconnah Creek. These are low-income, high unemployment census tracts, 99 to 100 percent Negro. One-third to one-fifth of the families in these census tracts had 1969 incomes below the poverty level. The greenway is within walking distance of these areas. In addition, each of the major north-south streets and highways crossing the greenway is serviced by the Memphis Transit Authority.

Recreation visitation to T. O. Fuller State Park was recorded to be 667,650 for Fiscal Year 1970-71, while Memphis Park Commission estimated usage of Riverside Park to be 150,000. The Corps estimate of greenway visitation is based on the assumption that the greenway will be fully developed by 1985 with a trail system connecting Nonconnah Lake to one of the parks at the mouth. Initial use is forecast at 140,000 in 1980 increasing to 540,000 by 1985. Table C-5 translates these visitation projections into dollar benefits.

Table C-5

Recreation Benefits

	Annual Recreation Days	Unit Value $	Annual Benefit $
South Park	600,000	1.50	900,000
North Park	350,000	1.00	350,000
Greenway	500,000	1.00	500,000
Total			$1,750,000

Unit values taken from Supplement No. 1 to Senate Document 97.

5. COSTS OF THE RECOMMENDED PLAN

a. General. Estimates of first cost are based on 1972 construction price levels. The annual costs are based on an interest rate of 5-5/8 percent. The amortization of investment costs were computed on the sinking fund basis for an economic life of 100 years.

b. First Costs. The unit costs used are based on 1972 construction cost levels. A contingency allowance of 25 percent has been included. Interest during construction has not been included since construction period of flood control features is less than two years, and recreation benefits will accrue as portions of the project are completed. The detailed cost estimates for the recommended plan and the other plans considered are contained in the Cost Appendix B.

c. Annual Costs. Estimates of annual cost include 5-5/8 percent interest charged against first costs plus amortization for a project life of 100 years. Project operation and maintenance costs are entered as annual cost. In addition, an annual charge is included to cover a major rehabilitation of the channel once during the project life. A summary of these annual costs is shown in Table C-6.

Table C-6

Summary of Estimated Annual Costs
Recommended Plan of Improvement

	Total $
First Cost (Investment)	56,449,000
Annual Charges:	
Interest on Investment, at 5-5/8%	3,175,200
Amortization	13,400
Operation, Maintenance & Major Replacement	636,000
Total	$3,974,600

6. ECONOMIC ANALYSIS

a. Benefit Summary. The benefits attributable to the recommended plan have been discussed in Section 4. It is estimated the proposed plan will yield $6,075,200 in annual benefits.

b. Project Justification. The economic justification of the proposed improvements can be ascertained by comparing the equivalent average annual charges (i.e., interest, amortization, and maintenance costs) with an estimate of the equivalent average annual tangible benefit which would be realized over the 100-year period of analysis selected. The average annual benefits preferably should equal or exceed the annual costs if the Federal Government is to contribute toward the project.

The value of benefits and costs at their time of accrual are made comparable by conversion to an equivalent time basis using an appropriate interest rate. A directed rate of 5-5/8 percent applicable to public projects was used in this report. The net effect of converting benefits and costs in this manner is to develop equivalent average annual values.

c. Benefit to Cost Ratio. Total average annual benefits are $6,075,200 as described in paragraph a. Total average annual costs as shown in Table C-6 are $3,974,600. Therefore, the benefit-cost ratio for the project is 1.6 to 1.0.

7. METHODOLOGY

The development of costs and benefits follows standard practice. The value of all goods and services used in the project is estimated on the cost side. On the benefit side, flood damages prevented and recreational values created are estimated. The development of damages prevented is based on damage surveys which obtain damage information related to stages, or elevations of such damage. This material is then related to frequency data to convert it to average annual values. Modifications in this data, introduced by project effects, permit the computation of annual benefits. The following paragraphs describe the details of the benefit evaluation procedures.

a. Flood Damages.

(1) General Procedures. In order to account for variations in hydrologic, hydraulic, and economic characteristics along Nonconnah Creek, the stream was divided into reaches and cross-sections on the basis of common economic characteristics, similar patterns of flooding and uniform hydrologic and hydraulic charactertistics. A total of 15 stream cross-sections were evaluated. A map illustrating the reach designations and cross-section locations is provided on Plate C-5. Reach I extends from the mouth to Lamar Avenue; Reach II extends from Lamar Avenue to Mt. Moriah Road; and Reach III extends from Mt. Moriah Road to the dam site. A breakout of flood damages with and without the recommended plan is shown in Table C-8.

Average annual flood damages for each reach were computed by the frequency probability method. This method involves development of elevation-damage relationships for successive stream cross-sections, along with corresponding elevation-discharge and discharge-frequency relationships. The elevation-damage data is combined with the elevation-discharge data to produce a damage-discharge relationship. This, when combined with the discharge-frequency data, results in a damage-frequency relationship or curve.

(2) Average Annual Damages. Average annual damages were obtained by integrating the damage-frequency relationships. Discharge probabilities under the conditions of flood control obtainable by the various plans of improvement under study were then applied to discharge-damage data to derive the residual flood-damage potentials. The differences between average annual damages with and without the several plans of flood control improvements considered represent the flood control benefits attributable to each of the alternate plans evaluated.

The actual computations were made by utilizing a computer program entitled "Econ II" which was developed by the Soil Conservation Service,

USDA. Since the program was designed for IBM equipment, it had to be modified by Corps ADP personnel to run on the General Electric computer at Waterways Experiment Station. Required inputs to the program included elevation-damage data, discharge-frequency data for the 200-, 100-, 50-, 25-, 10-, 5-, and 2-year floods, and elevation-discharge data, each referenced to cross-section. Sixty-six separate computer runs were made in analyzing this complex project.

Table C-8

Average Annual Flood Damage by Reach With and Without the Recommended Plan 1980 and 2000

Economic/Hydrologic Condition	Damage Reach I	Damage Reach II	Damage Reach III	Total
	$	$	$	$
Damages without project:				
1980	767,200	2,105,800	260,500	3,133,500
2000	1,522,500	3,039,000	553,500	5,115,000
Damages with project:				
1980	0	6,300	5,200	11,500
2000	10,600	36,000	16,600	63,200
Damages prevented:				
1980	767,200	2,099,500	255,300	3,122,000
2000	1,511,800	3,003,100	536,900	5,051,800

Individual values may not add due to rounding.

An example of the required input data in conventional format is included in this appendix. Elevation-damage, elevation-discharge, discharge-frequency, and damage-frequency curves for cross-section number 50 are shown on Plates C-6 through C-10.

b. Damage Surveys. Identification of the flood problems of the watershed and appraisal of damage potentials were undertaken jointly with the Soil Conservation Service. The Corps developed stage damage relationships for the properties below Lamar Avenue while the Soil Conservation Service developed these relationships for properties above Lamar Avenue. The 100-year and 200-year floods were outlined on 1:4800 scale aerial photographs. All structures within the floodplain were numbered and inventories of potential flood damage were made in the office and field. Investigations were made to determine the relationship between the flood stage in each cross-section and the resulting damages to existing developments on the floodplains. Such a relationship, when correlated with the probable frequency of recurring flood stages, is a guide to the forecast of future flood losses. It also furnishes data required to determine the economic justification of flood protection measures under consideration.

(1) Residential Damages. In determining residential damages, first floor elevations and other points of zero damage were obtained by field surveys and the market value of residences was established from assessed valuation derived from the records of the Shelby County Tax Assessor's office. Having established the market value and first floor elevation, the damage to each residence, together with furnishings, was determined from tables prepared for this purpose. These tables designated the damage to dwellings and furnishings with market value within the range of those found on the floodplain. The tables were prepared by estimating for each property valuation the probable flood loss, based on the depth of water over the first floor, that would result to floors, walls, heating facilities, furniture, and appliances in a house of such valuation.

(2) Commercial Damages. In determining commercial damages, first floor elevations or other points of zero damage were obtained as indicated for residences. Each commercial establishment was classified as either small, medium, or large. Having established the size and first floor elevations of each such establishment, the damage was then determined from tables prepared for the purpose. These tables were the result of detailed studies for specific type of commercial establishments such as drug stores, banks, men's clothing, offices, restaurants, etc. The physical loss included the damage to the building, including furnishings, fixtures, equipment, stock, and cleanup.

c. Damage Analysis Time Frames. Flood damages under with and without project conditions were analyzed at three points in time: (1) existing (1970-71), (2) base year (1980), and (3) future (2000). Base year represents the first year of full operation of the project proposed in the recommended plan and is the initial year of the 100-year period of analysis used in project evaluation. Future is that point in time when it is anticipated that the floodplain will be fully developed up to the dam site. Each time frame has different economic and hydrologic conditions associated with it. The conditions applicable to each time frame are summarized in the following matrix.

Matrix of Time Frames

Time Frame	Year	Economic Conditions	Price Level	Hydrologic Condition
Existing	1970-71	Existing	1971-72	Existing runoff
Base year	1980	Existing and projected floodplain development to 1980	1971-72	Extrapolated
Future	2000	Existing and projected flood-plain development to 2000	1971-72	Future runoff urbanized watershed

d. Projected Economic Development. The basic assumption was made that future development within the floodplain will proceed with the same types of development experienced in the recent past but at an accelerated pace. Local zoning regulations allow development of the floodplain for commercial and residential use subject to land fill or some alternative method of flood proofing on approval of the city or county engineer. The floodplain will be developed regardless of whether or not the recommended plan is constructed by the Corps of Engineers.

Local planning officials were consulted and numerous planning reports and studies relating to the study area were reviewed in order to establish a reasonable estimate of floodplain development. Basin information was obtained from 1:500 scale city and county zoning maps, the 1966 Comprehensive Land Use Study, the continuing Memphis Urban Area Transportation Study (MUATS), the comprehensive community facilities, services, and parks studies. A listing of those major studies and reports consulted is contained at the end of this appendix.

It was the concensus that the Nonconnah floodplain would be fully developed from U. S. Highway 61 (Third Street), about mile 4.2, to Kirby Road, mile 15.2, by the time the proposed plan could be in operation.

In order to determine average annual damages without the project on the area to be developed, existing developed acreage disaggregated into three types of land use was planimetered off the 1:4800 aerial photographs. Acreage devoted to single family units, multiple family units and commercial use was tabulated. Average annual damages by land use type were divided by total acres in each land use class to arrive at an average annual dollar damage per acre. Map overlays showing location of future highways, parks,

and other public facilities were utilized to net out available land for residential and commercial development. All developable acreage within the floodplain was planimetered and allocated to type of development based on current zoning and planning forecasts. The average annual dollar damages by land use class was then multiplied times the number of acres to be developed during the time frames in question. The average annual damages estimated on the lands projected to be developed was then added to the existing structure damage in the appropriate time frame.

This methodology projects future damages in constant prices and does not include an "economic increase adjustment" to approximate more intensive development of the floodplain nor increasing real value of damageable assets. In addition, the benefit evaluation does not include any possible credits for increased land utilization or intensification benefits. These additional benefits can be evaluated during Phase I of the design memorandum. Area redevelopment benefits were not computed because of the low unemployment rate existing in Shelby County at the time of the evaluation.

e. Recreation. Recreation needs are well known and easily documented by citing the studies listed in Section 3b. Projection of recreation visitation was more difficult. Initial attempts to project recreation visits applicable to the proposed reservoir utilizing the methodology outlined in ER 1120-2-403, "Procedure for Estimating Recreation Use," proved to be unrealistic. Utilizing per capita use rates from three reservoirs having similar physical characteristics as shown in Technical Report No. 2, "Estimating Initial Reservoir Recreation Use," yielded visitation ranging from 2.1 million to 5.4 million annually. The methodology does not seem appropriate for small reservoirs in close proximity to large urban areas.

Because of the large potential demand available shown in the needs analysis, the market will absorb whatever recreation opportunities the public chooses to provide. In light of this, visitation was developed by the facilities carrying capacity approach utilizing optimum standards for component facilities as shown in the State of Tennessee Comprehensive Outdoor Recreation Plan.

All recreation visitation projections were compared with visitations reported for area parks providing similar type recreation opportunities for reasonableness. These included T.O. Fuller State Park (667,650 visits 1970-71), Meeman-Shelby State Forest (603,833 visits, 1970), and Dr. Martin Luther King, Jr., Riverside Park (150,000 visits, estimated average annual).

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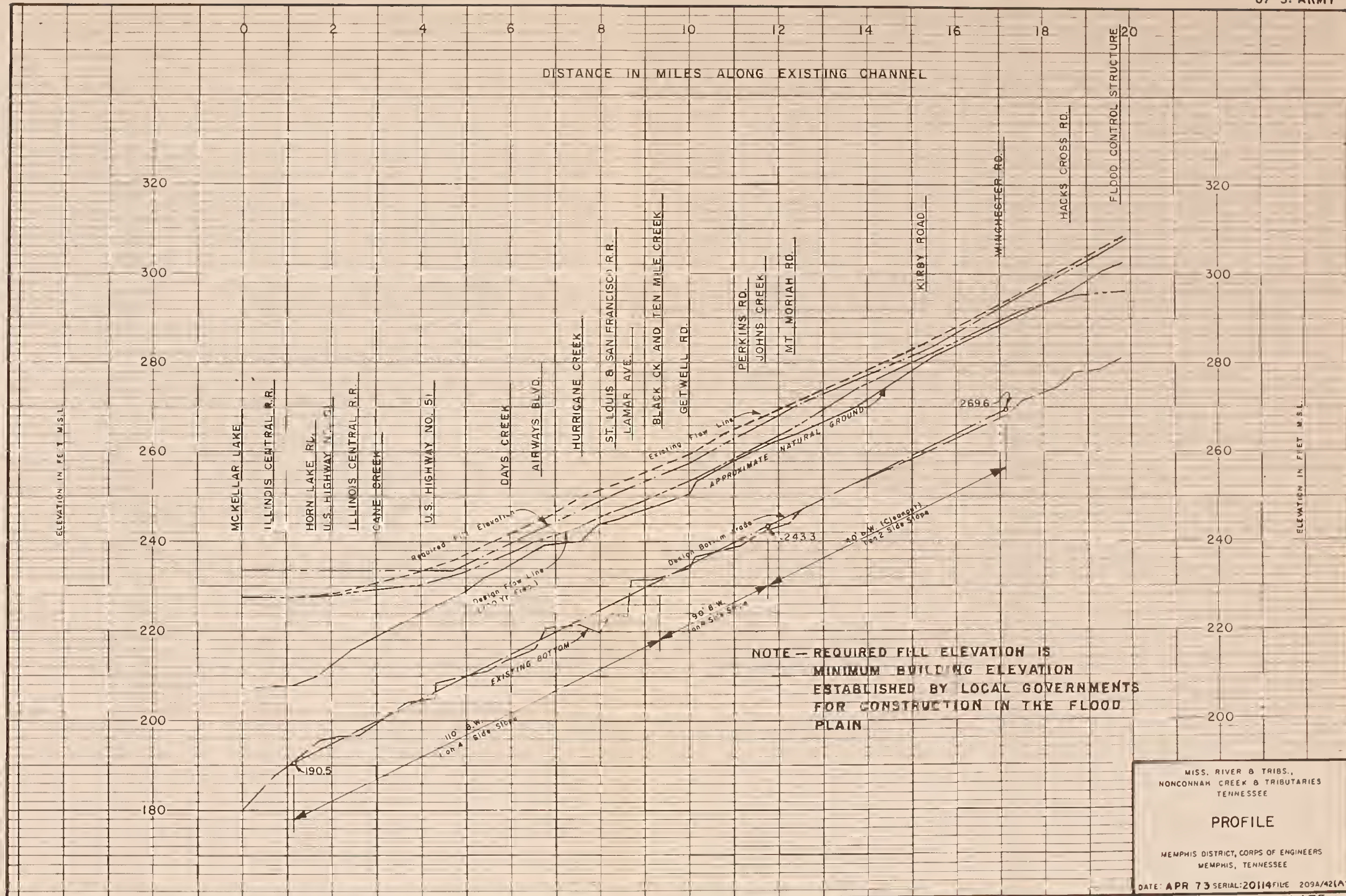
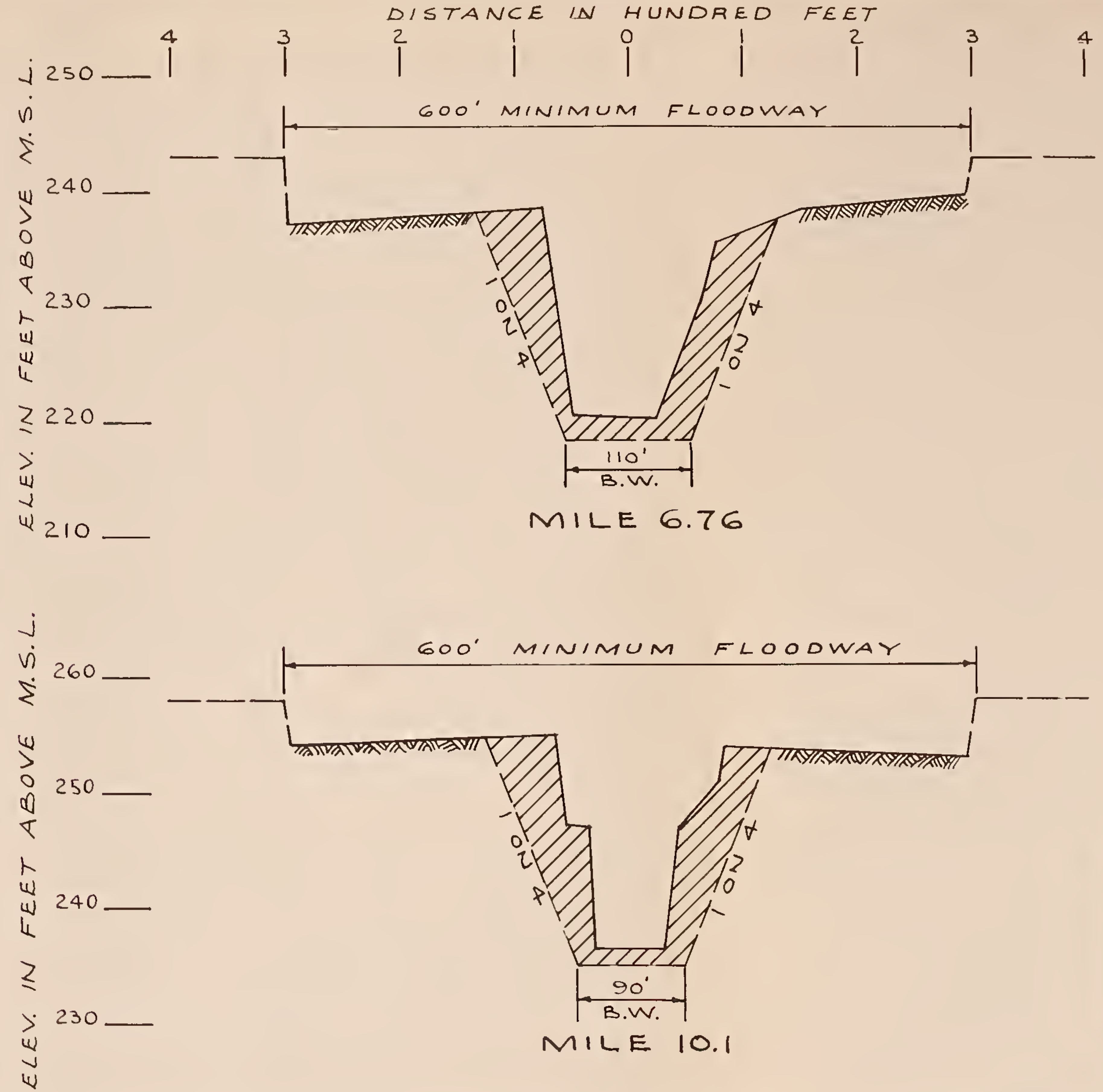

DISTANCE IN MILES ALONG EXISTING CHANNEL
0
2
4
6
8
10
12
14
16
18
20
ELEVATION IN FEET M.S.L.
320
300
280
260
240
220
200
180
MC KELLAR LAKE
ILLINOIS CENTRAL R.R.
HORN LAKE RD.
U.S. HIGHWAY NO. 51
ILLINOIS CENTRAL R.R.
CANE CREEK
U.S. HIGHWAY NO. 51
DAYS CREEK
AIRWAYS BLVD.
HURRICANE CREEK
ST. LOUIS & SAN FRANCISCO R.R.
LAMAR AVE.
BLACK CK. AND TEN MILE CREEK
GETWELL RD.
PERKINS RD.
JOHNS CREEK
MT. MORIAH RD.
KIRBY ROAD
WINCHESTER RD.
HACKS CROSS RD.
FLOOD CONTROL STRUCTURE
Required Fill Elevation
Existing Flow Line
APPROXIMATE NATURAL GROUND
Design Flow Line
Design Bottom Grade
EXISTING BOTTOM
110' B.W.
1 on 4 Side Slope
90' B.W.
40' B.W.
269.6
243.3
190.5
NOTE — REQUIRED FILL ELEVATION IS MINIMUM BUILDING ELEVATION ESTABLISHED BY LOCAL GOVERNMENTS FOR CONSTRUCTION IN THE FLOOD PLAIN
MISS. RIVER & TRIBS.,
NONCONNAH CREEK & TRIBUTARIES
TENNESSEE
PROFILE
MEMPHIS DISTRICT, CORPS OF ENGINEERS
MEMPHIS, TENNESSEE
DATE: APR 73 SERIAL: 20114 FILE 209A/42(A-9)



MISS. RIVER & TRIBS.
NONCONNAH CREEK AND TRIBS.
TENNESSEE

CROSS SECTIONS

MEMPHIS DISTRICT
CORPS OF ENGINEERS
MEMPHIS, TENNESSEE

SCALE 1" = 100' DATE APR 73
SERIAL: 20114 FILE: 209A/42(A-10)

CORPS OF ENGINEERS
U. S. ARMY

MISS. RIVER & TRIBS.

NONCONNAH CREEK & TRIBUTARIES
TENNESSEE

GENERALIZED URBAN FORM

PREPARED BY
MEMPHIS DISTRICT, CORPS OF ENGINEERS
MEMPHIS, TENNESSEE

DATE: APR 73 SERIAL: 20114 FILE: 209A/42(C-1)

PLATE C-1

CORPS OF ENGINEERS U S ARMY

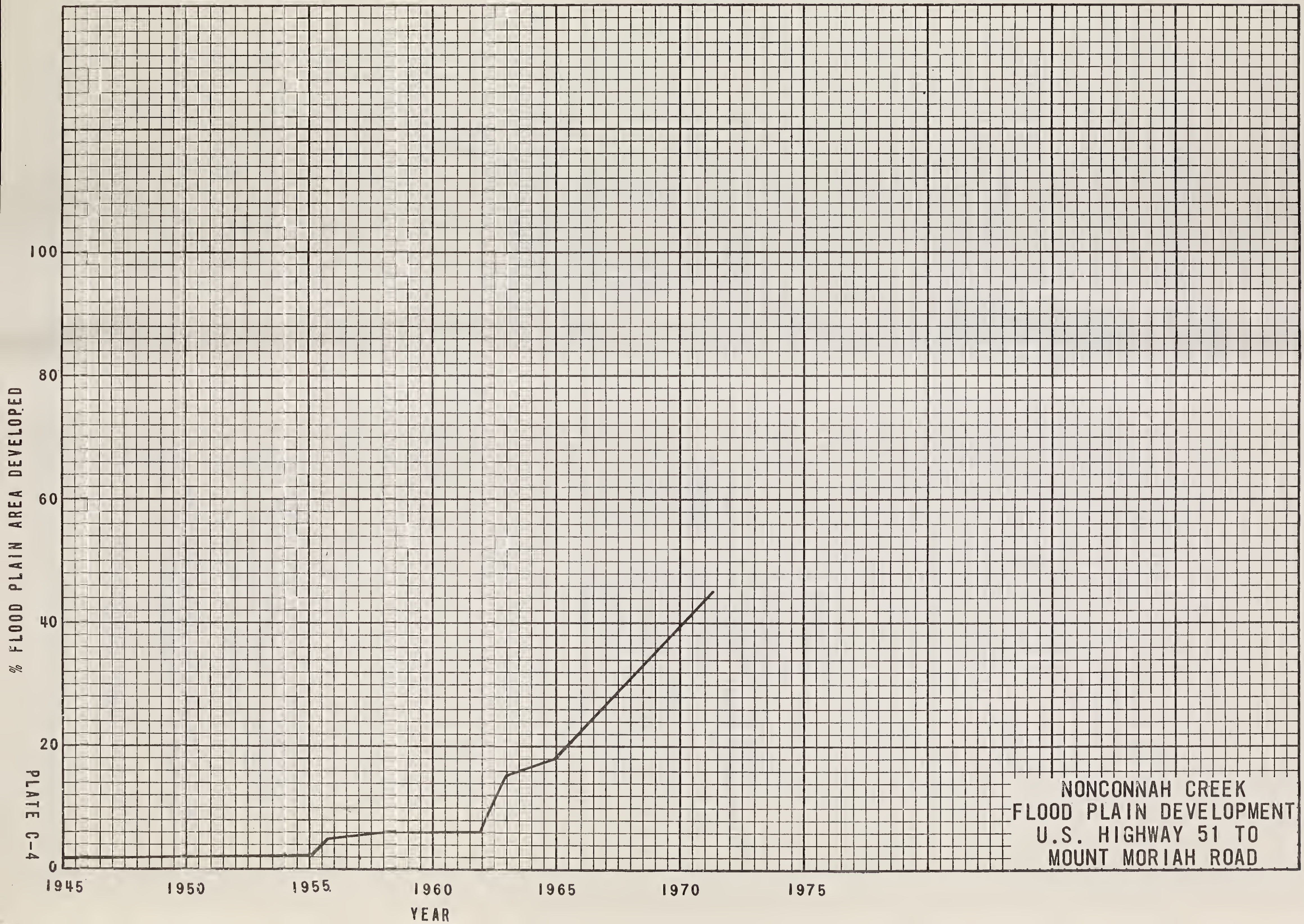


PLATE C-4

LEGEND

- RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL
- PUBLIC OR OPEN SPACE

MISS. RIVER & TRIBS.

NONCONNAH CREEK & TRIBUTARIES
TENNESSEE

GENERALIZED URBAN FORM

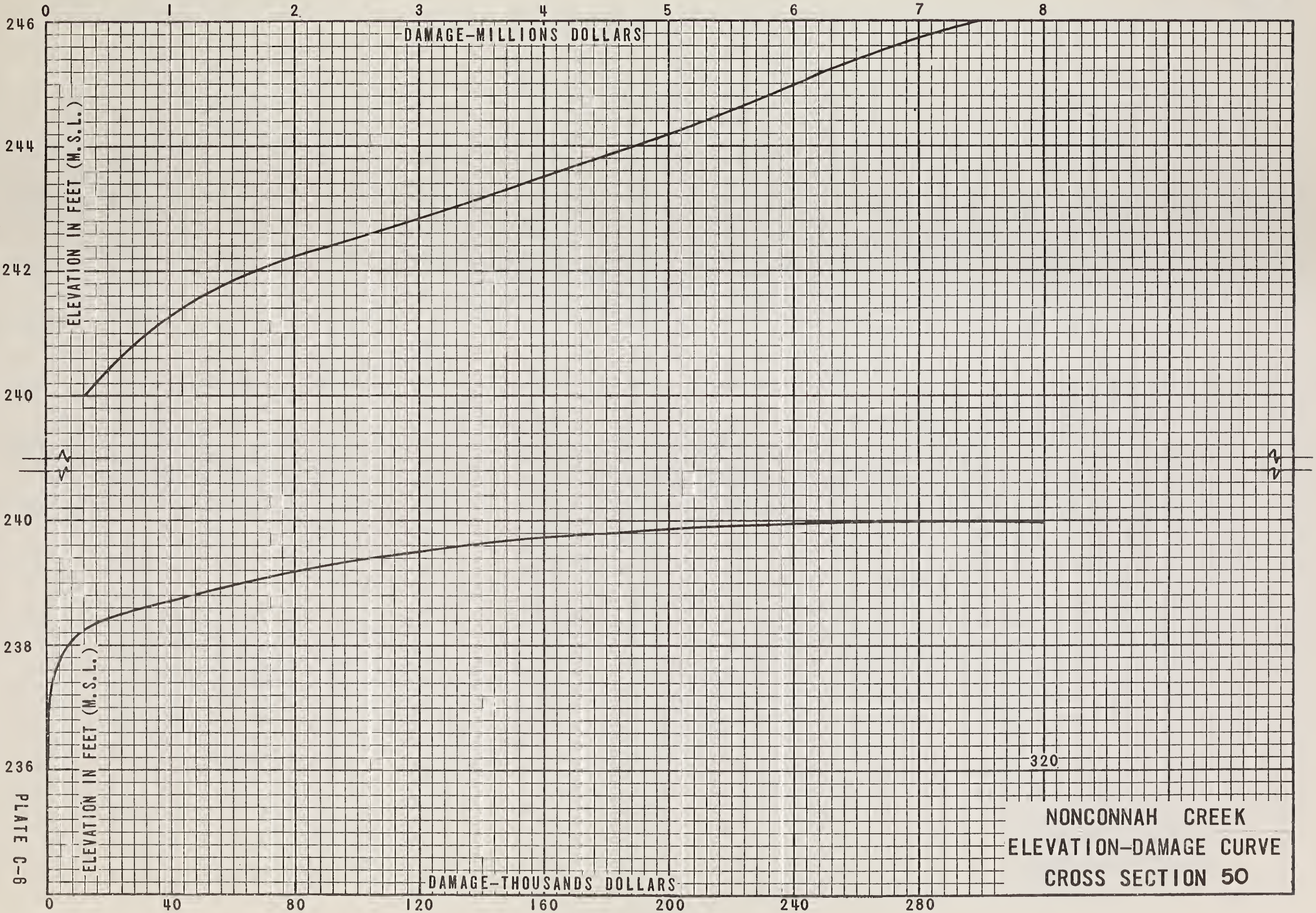
PREPARED BY
MEMPHIS DISTRICT, CORPS OF ENGINEERS
MEMPHIS, TENNESSEE

DATE: APR 73 SERIAL: 20114 FILE: 209A/42(C-2)

PLATE C-2

KE 10 X 10 TO THE INCH 7 X 10 IN. • ALBANENE® KEUFFEL & ESSER CO. 46 0707 MADE IN U.S.A.

CORPS OF ENGINEERS — U. S. ARMY



NONCONNAH CREEK
ELEVATION-DAMAGE CURVE
CROSS SECTION 50

PLATE C-6

CORPS OF ENGINEERS

U. S. ARMY

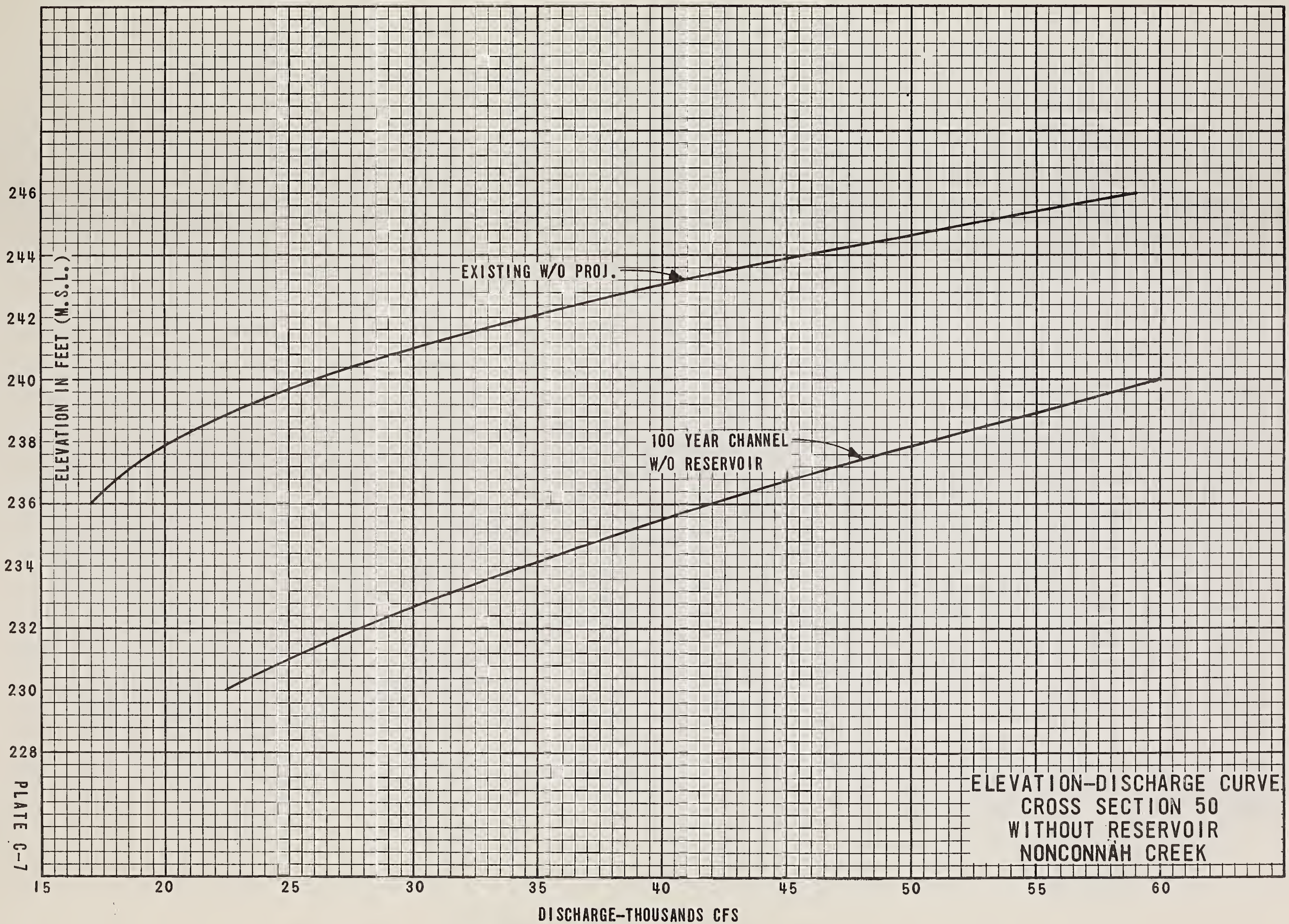
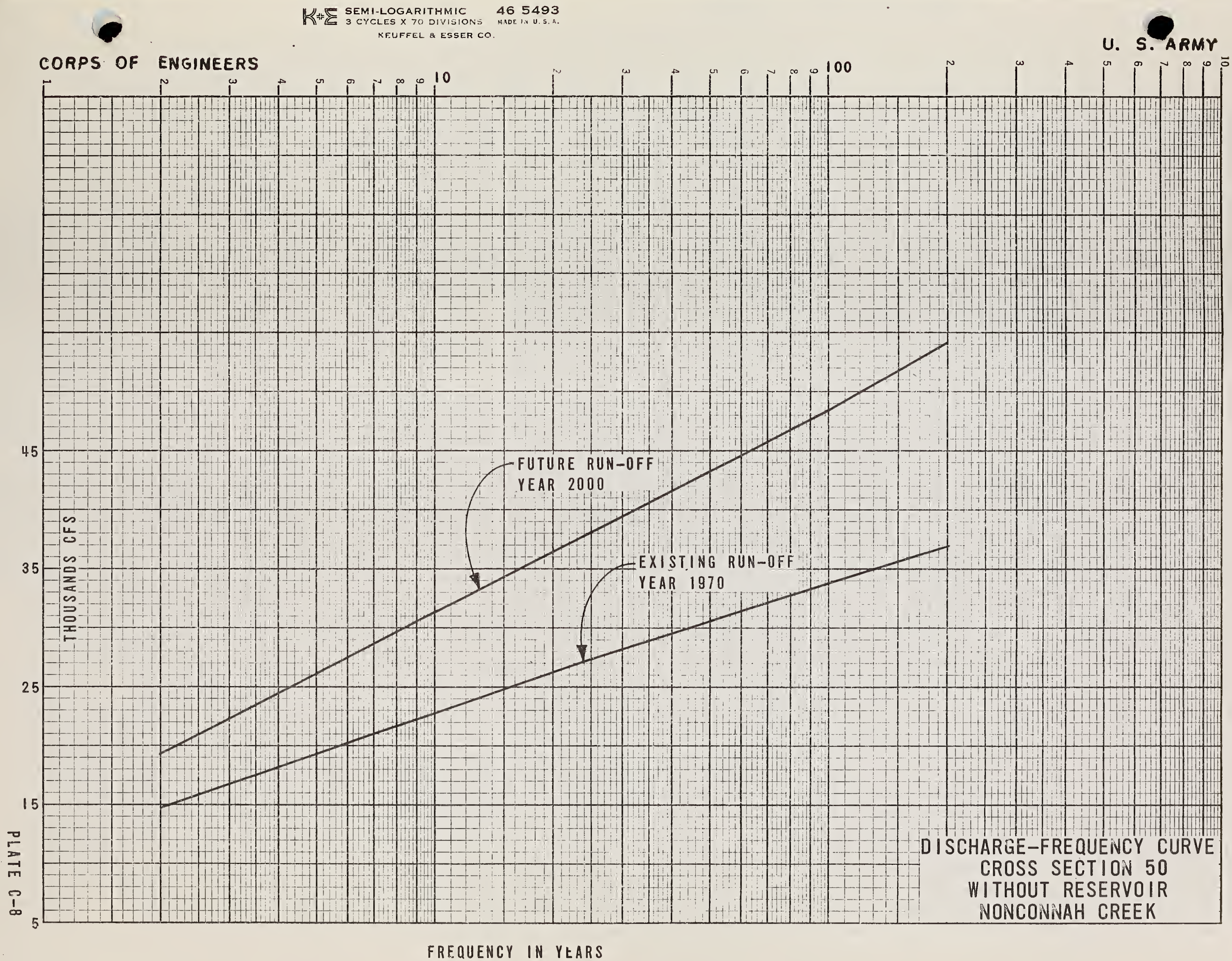


PLATE C-7



SEMI-LOGARITHMIC 3 CYCLES X 70 DIVISIONS
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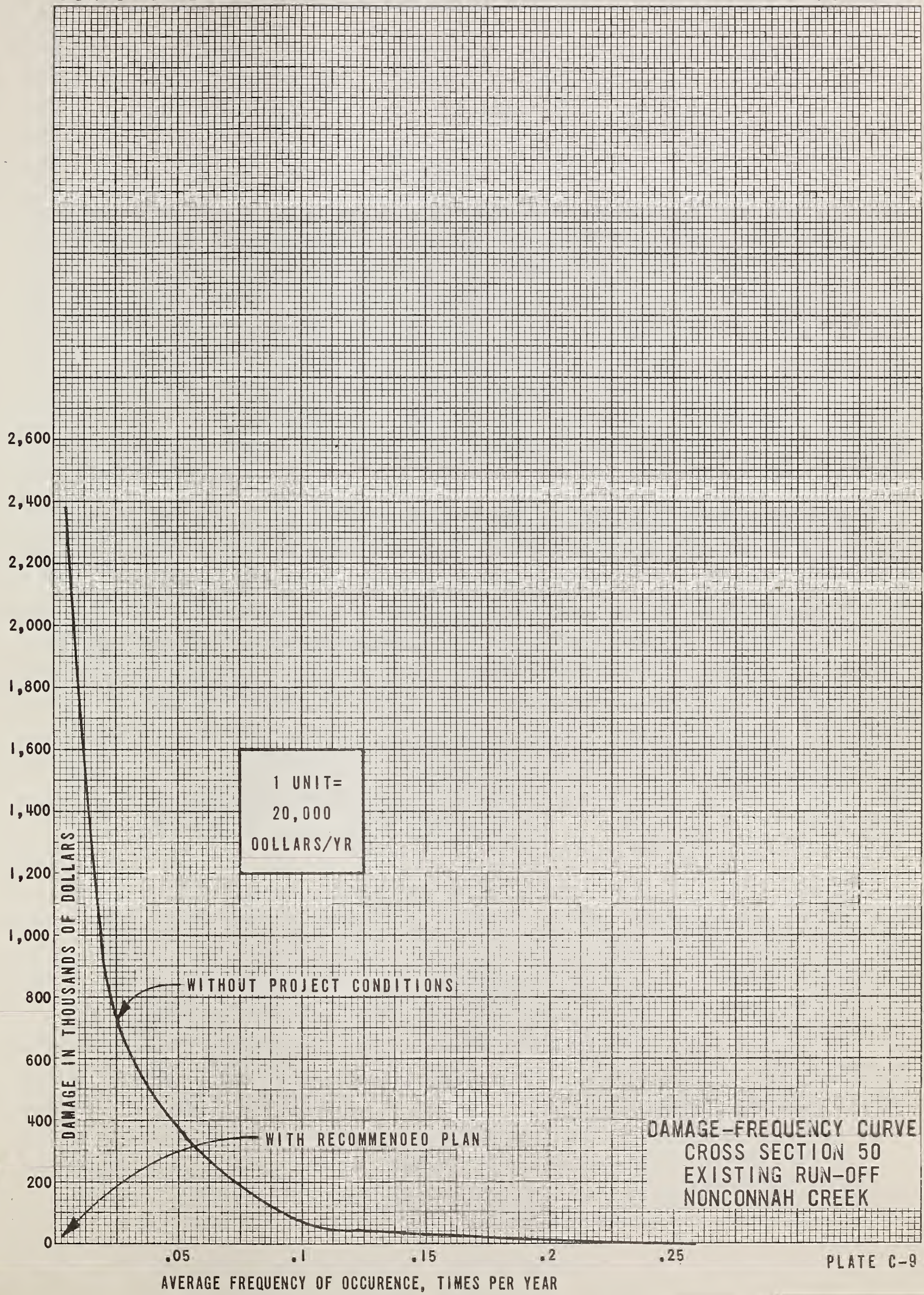
KEUFFEL & ESSER CO.
CORPS OF ENGINEERS
U. S. ARMY
FUTURE RUN-OFF
YEAR 2000
EXISTING RUN-OFF
YEAR 1970
THOUSANDS CFS
FREQUENCY IN YEARS
DISCHARGE-FREQUENCY CURVE
CROSS SECTION 50
WITHOUT RESERVOIR
NONCONNAH CREEK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CROSS SECTION 50
EXISTING RUN-OFF
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.05
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AVERAGE FREQUENCY OF OCCURENCE, TIMES PER YEAR

CORPS OF ENGINEERS U. S. ARMY

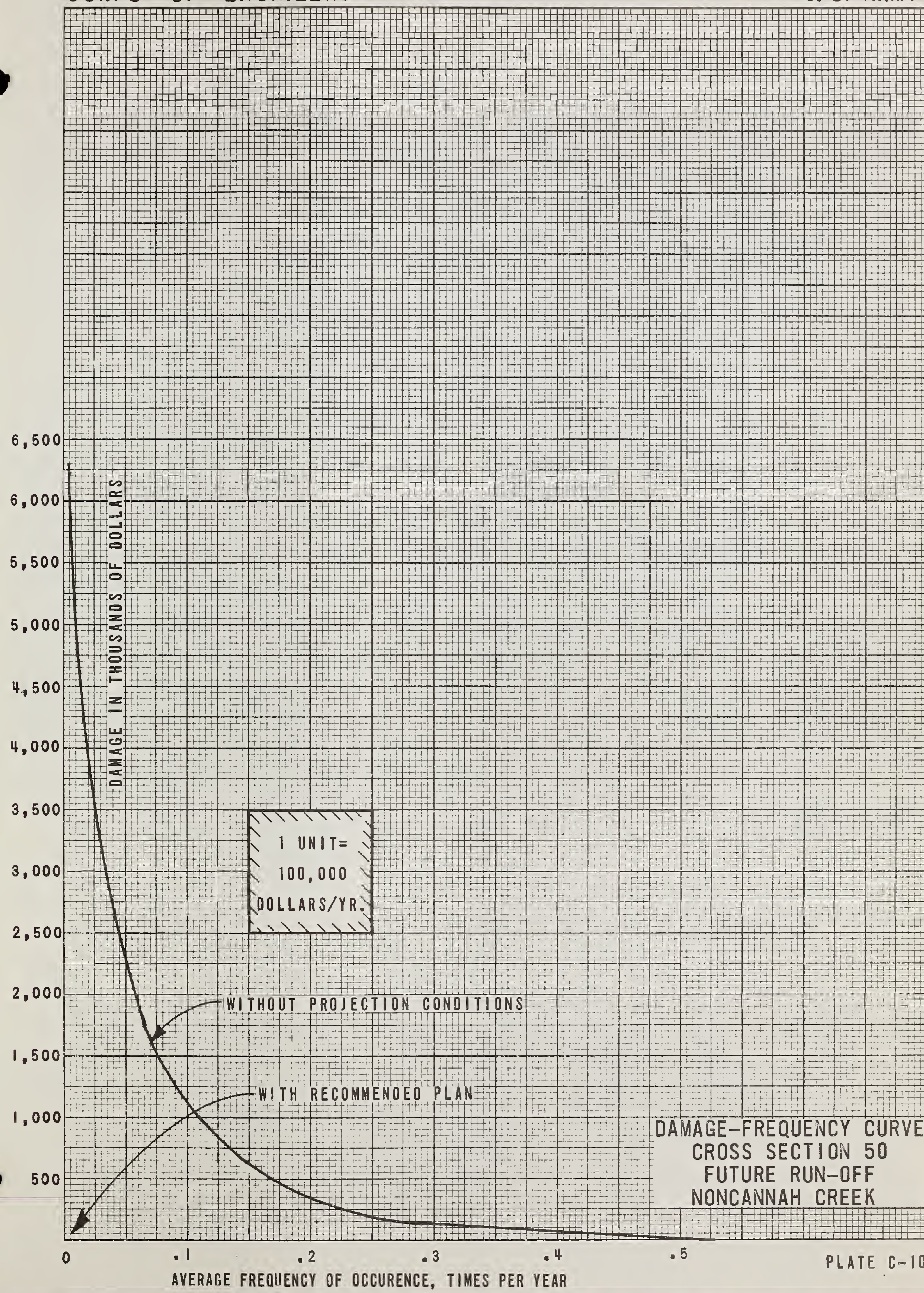


PLATE C-10

APPENDIX D

RECREATION RESOURCES

PROJECT FEATURES TO BE CONSTRUCTED BY CORPS OF ENGINEERS

NONCONNAH CREEK BASIN

GENERAL INVESTIGATION STUDIES

APPENDIX D

RECREATION RESOURCES
PROJECT FEATURES TO BE CONSTRUCTED BY CORPS OF ENGINEERS

1. INTRODUCTION

a. Authority. The authority for this report is contained in a resolution adopted on 28 October 1970 at the request of Senator Howard H. Baker and former Senator Albert Gore, both of Tennessee, with particular reference to the Nonconnah Creek Basin; and a resolution adopted on 29 September 1972 at the request of Senator Howard H. Baker to determine the advisability of constructing a project consisting of major reservoirs and channel improvements on the Wolf and Loosahatchie Rivers and the Nonconnah Creek and for upstream watershed improvements, all in the interests of flood prevention and control, water disposal, water quality control, water supply, recreation, fish and wildlife, environmental quality, watershed protection and allied purposes, with particular reference to the problems and needs on Nonconnah Creek.

b. Purpose. This appendix describes the existing physical resources and the recreational features proposed for the reservoir and greenway on the Nonconnah Creek project. An attempt is made to describe the demand, both existing and latent, and the facilities proposed to meet part of the demand.

c. Scope. The recreation considerations for this project are divided into two distinct areas. There are those that relate to the reservoir feature and those related to the greenway. A description of how the project meets the recreation needs of the various project users is discussed. The recommended plan will serve as a basis for conserving and enhancing the recreational and environmental potential of the basin and adjacent areas.

d. Background. The resolution adopted on 29 September 1972 referred particular attention to the immediate development and submission of an interim report on measures to eliminate critical floodwater and sediment problems on Nonconnah Creek and to provide needed water-based recreational opportunities and watershed protection within this basin. The report to be prepared and submitted in compliance with the provisions of PL 639, Eighty-seventh Congress.

The Chickasaw Basin Authority has agreed to serve as the local sponsor and meet local cost requirements for Federal water resource development projects in the Nonconnah Basin. The basin authority will provide local contribution and other assurances as required for construction and operation of the recommended flood control works, and recreation developments to include the recommended recreation storage, the North Park, and South Park on the Nonconnah Lake and the greenway development.

2. DESCRIPTION OF PROJECT AREA

a. Description. The Nonconnah Creek watershed is elongated in shape extending 30 miles from the headwaters in the state of Mississippi northwesterly to McKellar Lake. The dam site is approximately 20 miles east of McKellar Lake. The watershed covers 117,200 acres, 80 percent of which is in Shelby County (94,960 acres). The main tributary adjacent to recreational development is Johns Creek.

b. Climatology. The average annual rainfall over the watershed is about 50 inches. October is the driest month with an average of nearly 3 inches; January is the wettest month averaging 5 inches. About 58 percent of the annual rainfall occurs during the months of November through April.

Mean annual temperature of the watershed is about 62 degrees Fahrenheit. January is the coldest month with an average of 41 degrees; July is the hottest month with an average of 81 degrees. Maximum recorded extremes in temperatures range from 106 degrees to a minus 14 degrees. The average length of the growing season is about 237 days with the first and last killing frosts occurring in the months of November and April, respectively.

c. Topographic features.

(1) Topography. The valley of Nonconnah Creek is moderately sloping with well incised tributaries. Once away from the channel, the creek as well as the tributaries have moderately wide valley floors. The uplands are considered rolling to undulating.

(2) Geology. All drainages in the floodplains are covered with alluvium silt derived from the upland loess. This alluvium is up to 30 feet thick. Underlying the loess deposit except where removed by erosion is a terrace gravel comprised of well-rounded chert gravel and cobbles with a matrix of clayey sand or sandy clay. These soils are subject to flooding and in most cases drain poorly because of slow percolation rates.

(3) Land Use. Better than 40 percent of the area of the watershed is urbanized. This includes most of the area adjacent to the greenway. Other land use is estimated to be about 34 percent cropland, 17 percent pasture and idle, and 5 percent forest land. A considerable amount of land along the greenway is being held for speculation purposes. Farming operations on these lands in transition are irregular with little or no thought given to conservation.

d. Biological and Ecological Features and Resources.

(1) Forest Land. Less than 5 percent of the watershed is in forest cover. This cover consists of small, scattered patches of woodland in poor condition. Species composition is approximately 40 percent oak-hickory, 25 percent oak-gum-cypress, and 35 percent elm-ash-cottonwood. Except for a few isolated patches of forest land, the area adjacent to the greenway and reservoir are devoid of forest lands. Natural regeneration of quality species of timber on the project lands is highly unlikely, thus, revegetation will have to be accomplished manually if quality timber is to be available for future generations to enjoy.

(2) Hunting and Fishing. A study undertaken by the Soil Conservation Service in 1970 disclosed the following information about fish and wildlife resources in the basin. Hunting pressure on small game is quite high in the watershed due to the nearness to a large urban area. Most of the hunting now takes place in Mississippi and that portion of the basin just north of the state line. This includes the area which will be inundated for the lake.

In recent years production in Nonconnah Creek has been negligible due to the intermittent nature of the stream and severe pollution in the lower reaches. Isolated pools of water in the upper reaches have some value in maintaining a supply of fish food organisms utilized during high water. These pools also provide water for other species of wildlife.

(3) Water. There are presently short periods of time when there is no flow of water through the proposed greenway area of the Nonconnah Creek during the summer months. The reservoir will moderate the heavy flows during the spring and fall, and except during rare extended periods of drought, will be operated to provide a minimum flow of 3 cfs at all times.

e. Accessibility. Interstate Highway 240 bisects the lower half of the basin from east to west, and Interstate 55 crosses from north to south. There will be access to the greenway from both of these major highways. Other highway crossings include U.S. Highways 78, 61, 51, and 72 and a network of local streets and county roads provide access to the greenway and reservoir.

f. Environmental, Recreational and Cultural Conditions.

(1) Environmental. A detailed list of native upland flora and fauna of the basin is on file in the Memphis District Office. Higher plant aquatic vegetation is adequate to maintain balanced eco-system only in the upstream areas. Only one forth of the limited forested land is fully stocked with desirable species; three-fourths are less than 40 percent stocked. Birds present are representative of region with the exception of aquatic and water dependent species. Limited varieties of fish amphibians and turtles comprise the aquatic vertebrate fauna of Nonconnah Creek and its tributaries.

(2) Recreational. A Parks, Recreation and Conservation Plan for Memphis and Shelby County published by the Memphis and Shelby County Planning Commission in 1968 and revised in 1972 calls for an additional 30,000 acres of park and open space land to be acquired and developed by 1990 to meet the needs of the residents of Memphis and Shelby County. Of this total, 2,050 acres are needed for large urban parks, 14,132 acres for regional parks and 13,000 acres for greenways.

The Tennessee Statewide Comprehensive Outdoor Recreation Plan of 1969 as well as the Chickasaw Metropolitan Surface Water Management Study showed that the dynamic population of Memphis and Shelby County was not meeting a recreation demand of over 2,000,000 water-oriented visitor days. This unfulfilled demand will increase to over 3,000,000 by 1980. These fegures do not include a large latent demand for activities created by development of this project.

(3) Cultural. The Nonconnah Creek Basin contains approximately one-half of the area of the City of Memphis, Tennessee. Memphis is the primary trade center for the Mid-South. In 1970, Memphis and Shelby County had populations of 623,530 and 722,014 respectively. It is estimated that the Nonconnah Watershed had a population of 280,000 in 1965; projections indicate that the population will be 580,000 in 1990.

Most of the people in the basin are employed in the manufacturing, trade, transportation, or services industries associated with the Memphis Urban area. There are many industrial parks composed of light industry, warehousing, and office complexes throughout the basin. There are also several large industries representing major corporations in the basin. In the outer basin there are approximately 370 farms.

Better than 40 percent of the area of the watershed is urbanized. Parts of Germantown, Collierville and the heavily populated area of Whitehaven including the Memphis International Airport are in the basin. The southern loop of the perimeter expressway was completed along the northern edge of the Nonconnah Creek floodplain opening up this area to a major transportation artery.

g. Hydraulics and Hydrology. Nonconnah Creek is relatively straight from the mouth to a point about 20 miles upstream, which is the approximate location of the proposed dam. The existing channel section varies from a 90-foot bottom width and a 20-foot depth near the mouth, to 30 feet by 20 feet at mile 12, to 20 feet by 20 feet at mile 22. The stream gradient is approximately 6 feet per mile. The stream is relatively free of noticeable amounts of pollution from Mt. Moriah Road upstream to its headwaters. From Mt. Moriah Road to its confluence with McKellar Lake pollution increases rapidly.

Because of concern about such factors as turbidity and sediment, water samples were taken from tributaries that flow into the proposed Nonconnah Lake. During the same period, samples were taken upstream and downstream from the existing Sardis and Arkabutla Lakes, located south of the Nonconnah Creek in Mississippi. Both of these lakes are used extensively for all types of water based recreation. The Nonconnah samples appeared less turbid than Arkabutla, and were approximately equal to the samples taken from Sardis.

The water depths in the lake will range from three to 18 feet, with depths of 30 to 40 feet within existing channels which will be inundated. There will be approximately 500 acres of surface area approximately three feet in depth. There are no constant sources of water supply into the lake area, and therefore the lake level will fluctuate, depending on rainfall, evaporation, seepage and rate of discharge. This fluctuation will not affect access to the lake from adjacent park facilities.

h. Existing features. There are no properties in Nonconnah Creek Basin listed in the National Register of Historic Places.

Encroachment into the floodplain by landfilling and development is contributing to the flooding problems in the project area. Continued piecemeal development of the floodplain will result in an increase in unsightly wasteland areas. Projections show forest cover being reduced to less than 1 acre in every hundred unless preventative conservation measures are taken.

Lack of a concerted program of land treatment, structural measures and zoning restrictions will result in an acceleration of flood damages in urban and agricultural areas of the basin, continued deterioration and loss of woodlands, water quality and associated wildlife, and loss of opportunities for the development of water-based outdoor recreation.

i. Water Quality. The quality of the surface water resources will be greatly enhanced by the installation of the project. Suspended sediment has long been the major source of stream pollution. The long-term average annual suspended sediment concentration at the outlet of Nonconnah Creek will be significantly reduced. The lake will have substantially less contamination than found in tests of tributary flows because of dilution and assimilative action.

At present, fecal coliform counts in water flowing into the lake area are greater then permitted by state and local health agencies for body contact sports. The source of this contamination will be substantially reduced as controls of wastewater discharge are met. The fecal coliform count will not create adverse conditions for other lake uses and will not be noticable to any of the senses.

Poor quality of water in lower reaches and intermittent flows have placed severe restrictions on the variety of aquatic plants and animals. However, aquatic macrophytes are well represented in the upper reaches of the stream, generally above Mt. Moriah Road. Higher plant aquatic vegetation is adequate to maintain a balanced eco-system in the upstream areas. In general, the producers (green plants) in the lower reaches of the creek are restricted which in turn limits consumers (vertebrate and invertebrate animals). Decomposers (bacteria and fungi) are abundant below mile 11 indicating the presence of domestic and industrial wastes typical of agricultural and urban runoff water. As noted, this is substantiated by high coliform and fecal streptococcal counts, along with standard plate bacterial counts which often exceed 100,000,000 per 100 ml. The creek is relatively free of organic pollution upstream from Mt. Moriah Road.

3. PROJECT DATA

a. Elevations and Surface Area in Acres.

(1) The project will have no minimum or draw-down pool.

(2) Elevation of the conservation pool will be 318.8 ft. msl with approximately 1,900 surface areas.

(3) The emergency spillway elevation will be 326.0 msl, the top of controlled flood storage. At this elevation the lake will cover approximately 3,280 surface areas.

b. <u>Morphometric Data of Normal Recreation Pool</u>.

(1) The mean depth of the lake will be 10.5 feet with the average depth at 6.9 feet.

(2) The mean breadth is approximately 4000 feet.

(3) Length of the reservoir is a little over three miles.

(4) The shore line length is approximately 12 miles.

(5) Except for a three cfs minimum outflow throughout the year, changes in elevation throughout the season will be the result of meterological factors. Based on available runoff records and standard envaporation rates as established by the U. S. Weather Service, maximum fluctuation of one-half to one foot can be expected in any given year because of evaporation. Following periods of heavy rain, water levels will fluctuate to a maximum of seven feet. Controlled outflow will require about 4-1/2 days to return the lake to conservation pool stage after a 100-year flood occurrence.

4. RECREATION MARKET AREA.

a. Because of the tremendous growth in Shelby County, the overwhelming demand for all day use and overnight use recreation facilities proposed in this study will be used by the residents of Shelby County.

b. As previously mentioned under the Cultural heading, most of the people in the Nonconnah Creek Basin are employed in the manufacturing, trade, transportation or services industries associated with the Memphis urban area. While there is still a lot of acreage in farmland, less than 14 percent of the population of Shelby County lives outside of the Memphis Metropolitan area. Medium family income in the Shelby County portion of the basin ranged from a low of $5,000 to a high of $23,000 per census tract.

(1) The existing population of Shelby County is 722,014 (1970 census).

(2) It is projected that the county population will grow to 841,900 by 1980 and approximately one million by 1990.

(3) The Memphis Metropolitan area is growing in every direction. Growth to the west has been slowed because of the Mississippi River on that border, but with the new interstate bridge completed, it is anticipated that the population of the West Memphis area as well as the surrounding area will rise rapidly. It is also anticipated that in the not too distant future, the Memphis Metropolitan area will fill the borders of Shelby County.

As is the case throughout the United States, more leisure time is creating an ever increasing demand for recreational outlets. Since all of the recreation facilities proposed in this project will be within a maximum 30-minute drive from a projected million population, the demand will be great. One of the main needs for the general public in the resevoir area is day use facilities. There is a greater demand for swimming and fishing areas and picnic facilities in Shelby County than can be met by all existing facilities and all those proposed including the Nonconnah Creek project.

The Tennessee Statewide Comprehensive Outdoor Recreation Plan of 1969 stated that the region including Shelby County shows the greatest need for recreation facilities in Tennessee. There were 11 recreational activities that showed a need for over one million activity occasions each. These include the following: areas to play outdoor games, swimming beaches on adjacent water areas, fishing areas in lakes and ponds, car and trailer parking, picnic tables, horseback riding trails, and small game habitat.

c. Memphis and Shelby County have an abundance of small and medium size parks. Some of these have small lakes as part of the development. The neighberhood parks range from a little over one tenth of an acre to over 20 acres. There are large urban or regional parks ranging from less than 150 acres to almost 1,000 acres as in T. O. Fuller State Park. In addition, there is the Meeman-Shelby State Forest with 12,711 acres. This area has two lakes used for fishing only. All of these parks together have a total area of less than 18,000 acres. None of the parks were developed or may be developed to supply the water oriented recreation potential that the proposed Nonconnah Lake will supply.

There are some very fine forest trials in the state forest, but the greenway proposed in this study would be unique in supplying an urban oriented system of trails that the general public can gain access to within the Memphis Metropolitan area.

d. The 1969 Tennessee Statewide Comprehensive Outdoor Recreation Plan shows that recreation region 8, which includes Shelby County, has the following proportion of the state's needs for the listed recreation facilities:

1973

Facility	Percent
Fishing ponds, lakes, reservoirs	27.7
Swimming pools	35.5
Boat docks	30.2
Boat parking and launching area	42.5
Horseback riding trails	34.7
Play fields	27.0
18-hole golf course	41.1
Tennis courts	25.7
Picnic area	29.0
Trailer camping area	86.1
Tent camping area	41.7
Group camp	82.5

These needs will generally increase by 1980, 1990, and 2000. Neither local nor state governments are presently meeting the needs nor will they in the future if additional developments such as these related projects do not take place. As can be expected, most of the needs are generated by the residents of Shelby County.

The report further stated that to satisfy only the 1969 demands for these activities with quality recreation facilities and resources the area requires the following:

1,938 acres of play fields.
1,705,755 square feet of water adjacent to swimming beaches.
567,100 acres of fishing ponds, lakes and reservoirs.
6,283 car/boat trailer parking spaces.
280 miles of horseback riding trail.
5,716 picnic tables.
5,047,011 acres of small game habitat.

The Bureau of Outdoor Recreation completed an interim demand, supply, and needs study for outdoor recreation in the Chickasaw-Hatchie River basins, an area which contains part or all of ten of the 12 counties contained in Region 8 of the state of Tennessee plan. Region 8 includes all of Shelby County. The Shelby County population is greater than all the other counties combined and as such the figures in the chart that follows relate directly to the demand, supply and needs for recreation facilities for that county.

The results of the BOR study for water-oriented outdoor recreation were published in the USDA report, Chick -Metropolitan Surface Water Management Survey Report, 1971. The Burea of Outdoor Recreation study shows a need to provide opportunities for 3.2 million activity occasions in boating, swimming, camping and picnicking and 1.5 million man-days of fishing by the year 1980.

Table D-1

Water-oriented outdoor recreation demand, supply, and needs, present and projected
Chickasaw-Hatchie River Basins

Year and Activity	Activity Occastions Demand	Supply	Needs
1960			
Fishing 1/	1,272,767	304,501	968,266
1965			
Boating	1,394,600	708,500	686,100
Swimming	1,545,800	1,779,200	-
Camping	369,700	134,000	235,700
Picnicking	1,999,500	894,000	1,105,500
Total	5,309,600	3,515,700	2,027,300
1980			
Boating	1,767,900	708,500	1,059,400
Swimming	1,959,600	1,779,200	180,400
Camping	468,600	134,000	334,600
Picnicking	2,534,700	894,000	1,640,700
Total	6,730,800	3,515,700	3,215,100
Fishing	1,845,340	304,501	1,540,839
2000			
Boating	2,307,400	708,500	1,598,900
Swimming	2,557,600	1,779,200	778,400
Camping	611,600	134,000	477,600
Picnicking	3,308,200	894,000	2,414,200
Total	8,784,800	3,515,700	5,269,100
Fishing	2,736,982	304,501	2,432,481

1/ Fishing usage is expressed in man-days and applies only to Chickasaw Basin.

A further study entitled, Parks, Recreation and Conservation Plan for Memphis and Shelby County, was published in 1968 by the Memphis and Shelby County Planning Commission. This report was revised in 1972 and recommends a system of greenways be provided along major rivers and creeks throughout the county which in addition to providing flood protection could be developed with a system of trails and areas for picnicking and camping.

e. Development on this project is divided into two basic types, that which will be along the greenway and the facilities to be developed around the lake site. The facilities around the lake site are divided into a north and south park area. As proposed, the north park will serve only day-use visitors whereas the south park will have areas reserved for overnight use. There will be some duplication of facilities in these related projects as previously noted studies indicate a very large demand in the area that these facilities will only partially fill.

Considering the overwhelming demand for all types of outdoor recreation facilities in the Shelby County area, the main constraint to recreation development in the area is land and water available for development, and restrictions on over use.

The 1969 Tennessee Statewide Comprehensive Outdoor Recreation Plan developed factor standards for computing recreational usage for various activities with the unit of measure being the amount of land or water available for development. Utilizing these standards, the south park estimate of annual visitation will be 600,000 visitor-days when the park is completed. Although additional people could be accommodated, it would deteriorate the park and operation and maintenance costs would increase substantially.

The possibility of overcrowding also exists for the north park. Land available will be developed for intensive day use and will complement the south park. Annual visitation on the 120-acre site utilizing the above-mentioned figures is estimated to be 350,000 upon completion of the park development.

Extensive use of the greenway is not anticipated until some degree of revegetation has been accomplished particularly in the area west of Mt. Moriah Road to McKellar Lake. While it is estimated that the trail systems and related picnic facilities will generate over 500,000 visitor-days 10 years after completion of the project, initial visitation will be in the neighborhood of 140,000.

f. In an effort to illustrate the degree of growth in numbers of people participating in outdoor recreation, the following information was taken from the Outdoor Recreation Resources Review Commission Report (ORRRC Study Report) (1960 vs 1965).

Number of Participants in Outdoor Recreation - Total U. S. Picnicking, with 81 million participants or 57 percent of the population 12 and over, is the most popular summer outdoor recreation activity when the unit of measure is the total number of people who participate. Pleasure driving as in 1960, was in second place with 78 million persons or 55 percent of the population. In 1965 sightseeing moved from number four to number three in popularity. The activity which gained the largest number of adherents between the summer of 1960 and the summer of 1965 was walking for pleasure which had a gain of 57 percent. It is the fifth most popular activity. Playing outdoor games was sixth with a gain of 37 percent. Swimming the fourth most popular activity with 48 percent of the population participating. This was up from 45 percent in 1960.

One activity effecting this project with the largest percent increase from 1960 to 1965 was bicycling, with a 92 percent increase from 9 to 16 percent of the total population participating.

Desired Activities

Thirty-three percent of all persons questioned expressed a desire to participate in a summer activity which they were not doing at all. Swimming, golf, and fishing were ranked in highest order of preference. The two main reasons for not participating were given as lack of time and distance from home.

With picnicking, walking for pleasure and bicycling continuing to gain in popularity the greenway idea within the urban area will help supply some of the required space to participate in these experiences. The need, both existing and latent, for areas where people can enjoy the greenway experience is growing in inverse proportion to the amount of uncleared streamside left on Nonconnah Creek and similar areas in Shelby County. Throughout the nation, the public is demanding facilities within easy reach of their homes where they can walk or bicycle ride in an atmosphere where the automobile is not an intruder and where there are trees overhead and water nearby. Since there is very little of the original vegetation remaining on the banks of Nonconnah Creek between McKellar and Mt. Moriah Road, plans will be developed whereas channel cleanout would not further disturb the area. In most cases the south bank of the creek is more heavily developed industrially, thus most channel work should proceed from the same bank of the channel leaving the undeveloped bank relatively free from additional disturbance.

5. DETERMINE THE OUTDOOR RECREATION ATTENDANCE

a. As previously mentioned, the main constraint in the development of the Nonconnah Creek project for recreation is the overwhelming demand for all types of outdoor recreation facilities. Using the list of participation rates for the East South Central area published by the Bureau of Outdoor Recreation in 1965, and the estimated 1973 Shelby County SMSA of 770,000 persons, the demand for facilities is even

greater than previously stated. The following is a list of the most popular activities, their participation rates and the area demand.

Table D-2

Most Popular Activities for Region 8
Shelby County and Surrounding Area

Activity	Participation Rate	Demand (SMSA - 770,000)
Driving (sedan)	16.13	12,420,100
Urban walking	7.49	5,767,300
Sightseeing	6.45	4,966,500
Warm water fishing	6.27	4,827,900
Swimming	4.52	3,480,400
Playing outdoor games	4.43	3,411,100
Viewing outdoor games	4.05	3,118,500
Picnicking	3.93	3,026,100
Boating	3.72	2,864,400
Nature walking	3.30	2,541,000
Horseback riding	3.50	2,695,000

b. Initial attendance (three years after construction) at the combined recreational project will be approximately the same as the average annual attendance. It is estimated that because of the very great existing demand, and a large latent demand for the facilities proposed at this project, full use could be reached at both the North and South Parks within three years after completion of construction. It is estimated that it will take 10 years for the greenway to reach its maximum carring capacity of 500,000 activity occasions.

Following is a table showing the estimated carrying capacity of the three elements of the recreational phase of the Nonconnah Creek Project. The table is based on available land.

Table D-3

Recreation Days at the Nonconnah Creek Project

Activity	Standards: Unit of Measure	Standards: Annual Occasion Per Unit	South Park: Units Available	South Park: Activity Occasions	North Park: Units Available	North Park: Activity Occasions	Greenway: Units Available	Greenway: Activity Occasions
Playfields	Acres	4,800	50	240,000	40	192,000	--	--
Picnicking	Site	552	120	66,200	120	66,200	50	27,600
Tent Camping	Site	368	150 3/	55,200	--	--	--	--
Trailer Camping	Site	392	150 3/	58,000	--	--	--	--
Group Camp	1 Bed	84	40 3/	3,360	--	--	--	--
Tennis	1 Court	1,920	4	7,680	8	15,360	--	--
Volleyball 1/	1 Court	4,000	--	--	4	16,000	--	--
Basketball 1/	1 Court	4,000	--	--	3	12,000	--	--
Boating, Trailered	Parking Space	420	50	21,000	50	21,000	--	--
Boating, Docked	1 Boat Stall	193	40	7,720	--	--	--	--
Fishing (Boat & Bank) 1/	1 Lake Acre	100	500	50,000	1,000	100,000	--	--
Sightseeing 2/ 4/	32% of Total	--	--	220,979	--	200,050	--	173,312
Nature Trails	1 Mile	16,880	10	168,800	2	33,760	20	337,600
Bicycle Trails	1 Mile	6,720	--	--	--	--	20	134,400
Horse Trails	1 Mile	4,200	3	12,600	--	--	10	42,000
Attending Outdoor Sports 2/	13% of Total	--	--	89,773	--	62,500	--	--
Miscellaneous 2/	7% of Total	--	--	48,339	--	31,260	--	37,912
Total Activities				1,049,651		693,606		752,824
Activities/Visit				2		2		1.5
Total				583,106		346,803		501,882
Total Recreation Days Rounded				600,000		350,000		500,000 TOTAL: 1,450,000

NOTES: The standards for activity, days at this project, came from the Tennessee Statewide Comprehensive Outdoor Recreation Plan of 1969, except as noted.

1/ These factors were interpolated using information from the Tennessee plan as well as the Bureau of Outdoor Recreation 1965 survey of outdoor recreation activities.

2/ The percentage figures used were developed as total year figures for reservoirs in or close to urbanized areas.

3/ These figures were not divided by the Activities/Visit factor since the individuals participating in these activities spend most of the day at that activity.

4/ Includes driving for pleasure.

c. Real Estate requested for the recreational phase of the project over and above that required for flood control purposes is as follows. An additional 700 acres and 120 acres is recommended for the South and North parks respectively. In the greenway area an additional 850 acres will be required. Actually this 850 acres will have a joint use in that it will contain all the waters of the design flood.

6. RECOMMENDED PLAN OF DEVELOPMENT

a. The recommended plan for recreational development will be divided into three separate elements. The North and South Parks will be adjacent to thr proposed reservoir while the greenway will connect the parks to McKellar Lake along Nonconnah Creek. The following is a narrative presentation of each element.

(1) Greenway. The greenway will include approximately 1,400 acres of land and stream area. On this area, which will extend from McKellar Lake, 20 miles to the lake site, the proposed development will include 20 miles of hiking and nature type trails, 20 miles of bicycle trails and 10 miles of equestrian trails. The hiking and bicycle trails will extend the full length of the greenway while the equestrian trail will run from east of Mt. Moriah Road to the lake site. At various sites along the greenway, there will be parking areas which will allow the public to leave their cars and gain access to the trails. Along the trails, there will be five restrooms, groups of picnic tables for a total of 50 units, five picnic shelters and drinking water. In approximately 10 locations, it will be necessary to build bridges to cross perpendicular drainage. The entire length of the greenway will require landscaping to improve the existing conditions. As presently envisioned, there will be selected points along the greenway where there will be larger areas, wider than 600 feet, with picnic tables, small areas for games and possibly artificial lakes. The greenway will extend up to the proposed reservoir where it will split and connect to both the north and south shores of the lake. The estimated cost of the greenway development is shown on Table B-7, Appendix B.

(2) North Park. As with the South Park, the North Park will be developed around the proposed flood control lake to be constructed in the headwaters of the Nonconnah Creek. The lake will have a conservation or summer pool of 1900 acres. There will be approximately 12 miles of shore line of which less than 50 percent could be developed for recreation use.

Facilities to be included in the 120 acres reserved for the North Park will be developed along 2-1/2 miles of shore line starting at the axis of the dam. There will be two miles of walking trails connecting the North Park to the greenway. Areas near the waters edge would be developed for picnicking with 120 picnic tables with related facilities including three picnic shelters. A 2-lane boat launching ramp with a 50 car and trailer parking lot will be developed at the terminus of the main access road. It is planned to have three combination restroom-change shelters in the park area. About 40 acres of basically open area will be developed for grass play fields. One area for multiple use will be lighted. There will also be a large area of paved game courts, some of which will be lighted. Paved areas will include five tennis courts, two basketball and four volleyball courts, and related parking areas.

Access to all facilities will be by paved road. Most ot the 15,000 feet of road will be one-way. Required landscaping will be an improtant part of the overall development necessary to create a pleasing natural appearance in an area that has been cleared and farmed for a number of years. Estimated cost of the North Park development is shown in the Cost Estimate, Table B-3, Appendix B.

(3) South Park. The area to be developed as the South Park covers approximately five miles of shoreline on the south shore of the conservation lake. The park area starts at the southern axis of the dam and extends in an easterly direction. The greenway will terminate in both the North and South Parks, splitting in half west of the dam. The connection of the greenway to each of the parks will allow various trails to gain access to the parks. The equestrian trail will connect to the South Park where there are plans for facilities for feeding and boarding of horses. Horses will not be allowed in the North Park.

Other facilities planned for the South Park area will include 300 fully developed tent or trailer camp sites. Camping will be permitted only in the South Park. Additional facilities to be provided include a 2-lane boat ramp, boat docks, and related parking for cars and trailers. There will be an all-weather group camp and interpretive center for use by organized groups. The picnic areas will have 120 picnic sites, three shelters, and three restrooms will be placed in the park for public use.

Areas will be set aside for game fields, both grass and paved including four lighted ball fields, four lighted tennis courts, a lighted croquet area and five horseshoe playing units. A combination concession and restroom building and 150 parking spaces will serve the game area. Ten miles of trails and 2 miles of roads will interconnect all of the above-mentioned recreation facilities. Necessary operation and maintenance structures will be placed in the park and the entire area will be landscaped with trees, grass, and shrubs. The estimated cost of the South Park is shown in the Cost Estimate, Table B-2, Appendix B.

Depending on the reduction of fecal coliform count, and meeting other safety standards, there would be future plans to develop large beaches in both the North and South Parks.

b. The following standards for the Tennessee Statewide Comprehensive Outdoor Recreation Plan were used in developing the visitation figures for the three portions of the Nonconnah Creek recreation project:

Playfields. Playlots and playgrounds that are designated and maintained for ball playing, baseball, soccer, football, volleyball, and similar sports. Tennis courts and golf courses were excluded from this category.

Unit of measure: 1 acre
Average number of persons: 10
Daily turnover: 2.0
Length of season: 240 days
Standard: 4,800 activity occasions per acre of playfield per year.

Picnic area. Designated picnic areas where there is at least a table and bench or other seating facility provided for the public. Undeveloped picnic areas--called picnic areas only by the owner or administrator--were not included in this classification.

Unit of measure: 1 site
Average number of persons: 4 (1 family)
Weekly use of site: 6 times
Daily turnover: 1
Length of season: 23 weeks
Standard: 552 picnic activity occasions per picnic site per year

Tent camping area. An area developed especially for tent camping. It should include an access road, an area for pitching a tent, and other improvements. Owner-designated ground without improvements was excluded.

Unit of measure: 1 site
Average number of persons: 4 (1 family)
Daily turnover: 1
Weekly use of site: 4 nights
Length of season: 23 weeks
Standard: 368 activity occasions per tent camping site per year

Trailer Camping area. An area designed to provide facilities for travel trailers, self-contained travel trailers, pickup campers, motorized homes, and camping trailers. Trailer camping areas are generally more developed than tent camping areas.

Unit of measure: 1 site
Average number of persons: 3.5 persons (1 family)
Daily turnover: 1
Weekly use of site: 4 nights
Length of season: 28 weeks
Standard: 392 activity occasions per trailer camping site per year

Group camping facilities. Group camping is usually in barracks-type buildings, large tents, or large rooms of hotels, lodges, etc. This activity is associated with organized groups such as Boy Scouts, Girl Scouts, and church groups.

Unit of measure: 1 group camping bed
Average number of persons: 1
Daily turnover: 1
Length of season: 84 nights (six 2-week periods)
Standard: 84 activity occasions per group camping bed per year

Tennis court. Designed, maintained, and used for playing tennis.

Unit of measure: 1 tennis court
Average number of persons: 4
Daily turnover: 2
Length of season: 240 days
Standard: 1,920 activity occasions per tennis court per year

Horse trail. Designated, maintained, and marked trail, bridle path, or rough road used for horseback riding.

Unit of measure: 1 mile
Average number of persons: 5
Daily turnover: 4
Length of season: 210 days
Standard: 4,200 activity occasions per mile of horse trail per year

Boating. Two separate standards were developed for this activity: boat docking capacity was compared with boating activity, and boat launching facilities--expressed in number of car/boat trailer parking spaces (approximately 450 square feet per unit)--were used for a second comparison.

(1) Unit of measure: 1 boat dock
Average number of persons: 3.5 persons (1 family) per boat
Weekly use: 2.5
Length of season: 22 weeks
Standard: 193 activity occasions per boat dock space per year

(2) Unit of measure: 1 car/boat trailer parking space
Average number of persons: 3 (1 family)
Daily turnover: 1
Length of season: 140 days
Standard: 420 activity occasions per parking space per year

Nature trail. A marked trail for the purpose of enjoying and studying the natural environment.

Unit of measure: 1 mile
Average number of persons: 4 (1 group)
Daily turnover: 20
Length of season: 210 days
Standard: 16,880 activity occasions per mile of trail

Hiking trail. Similar to nature trails, but more appropriate to the activities of organized groups.

Unit of measure: 1 mile
Average number of persons: 4 (1 group)
Daily turnover: 8
Length of season: 210 days
Standard: 6,720 activity occasions per mile of trail per year

c. Due to the nature of the project, surrounded by urbanizing lands, there is little opportunity to preserve or enhance wildlife habitat for game hunting. Woodlands preserved in greenway areas and reestablished in park facilities will preserve habitat for small animals and various species of birds and enhance the esthetic quality of these resources.

Poor water quality exists below or west of Mt. Moriah Road. Upstream or east of Mt. Moriah Road the water quality is sufficient to support aquatic macrophytes. To maintain conditions necessary to support a balanced eco-system in the upstream areas and provide continuous flow on the stream throughout the year the reservoir will provide a minimum flow of 3 cfs.

d. The project calls for dressing, seeding and fertilizing of any areas disturbed during channel enlargement. In addition, $100,000 will be spent on each of the three recreational elements for revegetation of the areas. This is not to be considered a reforestation of the project, but mainly enhancement of the recreational resource.

7. INDENTIFICATION OF SPECIAL PROBLEMS

The conservation and enhancement of the environmental and recreational resources in the project area will depend to a great extent upon the overall plan of development of the industrial sites along the creek banks. Since most of the intrusions in Shelby County are on the south bank of the stream, it will probably require the major portion of the greenway to be on the north bank.

The greenway will extend up to the proposed reservoir where it will split and connect to both the north and south shores of the lake. It is proposed that the greenway will become a buffer between the park developments and all other residential or commercial development.

8. MANAGEMENT AND COST SHARING.

The Chickasaw Basin Authority has stated that it is their intention to fully develop and utilize the recreation opportunity of the Nonconnah Project. The basin authority has agreed to provide local contributions and other assurances required for construction and operation of the recommended flood control works and recreation developments, depending on availability of funds and authorization of the project at the Federal level.

Local cooperation for project features to be constructed by or with Federal funds through the Corps of Engineers will include the following:

(1) Pay or contribute in kind five percent of the first cost of the reservoir, including real estate, relocations, and all other costs associated with reservoir construction.

(2) Pay or contribute in kind 50 percent of first costs associated with development of water-based recreation facilities, including lands for the North and South parks.

(3) Administer the recreation facilities and bear all costs of operation, maintenance, and replacement related thereto.

(4) Pay or contribute in kind 75 percent of the total cost of lands within the proposed greenway which represents 100 percent of the estimated cost of lands which will be specifically needed for channel enlargement and 50 percent of the estimated cost for those lands which will be developed for recreation.

(5) Provide without cost to the United States lands outside the greenway which may be needed for spoil disposal; relocation assistance and payments required to comply with the provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646; and all alterations and replacement of utilities, bridges, streets, and highways, which may be required for construction of project, except railroads and interstate pipelines.

(6) Pay or contribute in kind 50 percent of the total first cost of recreational and environmental improvements to be installed in the greenway.

(7) Maintain and operate all works after project completion and comply with Section 221, Public Law 91-611.

(8) Hold and save the United States free from damages due to construction of the project.

9. ENVIRONMENTAL QUALITY

Working with the Soil Conservation Service and local agencies, emphasis will be placed on accelerating the conservation and land treatment programs covering over 35,000 acres of the watershed. Stabilization of critical runoff and sediment producing areas will reduce erosion and related damages on the lands upstream of the proposed reservoir. This in turn will improve the water quality of the lake.

Creation of the reservoir will have some adverse impact upon existing ecological conditions. Established terrestrial biota will be destroyed within the permanent pool area. Composition of aquatic life will be altered as a result of conversion from a stream to lake environment.

The establishment of the proposed greenway for a width of 600 feet along the creek below the reservoir will enhance the existing environment from an ecological and esthetic standpoint. If channel improvements can be completed from the side of the creek where most of the disturbance has already taken place, much of the existing flora can be preserved. The greenway will form the physical limits of the floodplain and be a major factor in bank stabilization.

As previously noted in this report $100,000 will be spent on each of the areas of the recreation plan for revegetation of those areas. Many areas within the proposed greenway which have been cleared and used as borrow will be replanted. In addition all areas disturbed by construction of this project will be shaped and planted with grass.

10. COSTS

All costs associated with this project are contained in Appendix B. Costs for the South Park, North Park and greenway are in Tables B-2, B-3, and B-7 respectively.

11. PLATES

The following plates contaned in the main body of this report a can be referred to for information on location of various elements of the recreation portion of this project:

Plate 2 - Plan of the entire project. This plate shows a plan view of project elements and their relationship to the urban areas of Memphis, Collierville and Germantown.

Plate 3 - This plate illustrates the various pools in the reservoir area and identifies the areas planned for park development.
Plate 4 - This plate shows an artists conception of the facilities and use of the greenway.

12. BENEFITS

The recreation benefits for the reservoir, associated park and greenway developments will be $1,750,000 annually.

The recreation value of the greenway is estimated to be $500,000 annually based on 500,000 visitor-days annually after revegetation of the area is complete.

The recreation value of the reservoir and associated park developments will be $1,250,000 annually based on an estimated use of 950,000 visitor-days annually.

APPENDIX E

FOUNDATION STUDIES

PROJECT FEATURES TO BE CONSIDERED BY CORPS OF ENGINEERS

INTERIM REPORT

NONCONNAH CREEK BASIN
GENERAL INVESTIGATION STUDIES

APPENDIX E
FOUNDATION STUDIES

1. SCOPE OF APPENDIX

The primary purpose of this Appendix is to discuss foundation conditions at the proposed retention structure on the main stem of Nonconnah Creek and side slopes on the proposed channel improvement. The channel banks will be constructed to 1 on 4 or flatter to enhance the scenic and recreational value of the proposed greenway. Steeper slopes would be difficult to landscape and maintain in a condition suitable for park use. Observed soil conditions and existing channel banks along Nonconnah Creek indicate that the channel improvement with 1 on 4 side slopes can be maintained adequately. Detailed analysis is not considered necessary for this General Investigation Report. A detailed analysis of proposed side slopes will be made in detailed project design phases prior to project construction.

2. SITE DESCRIPTION

The proposed site of the Nonconnah Creek Dam is located on its own alluvium between the adjacent uplands. Borings on the uplands on both sides of the creek show the following profile: Silt, fine sand and clay, gravel, silty clay, fine white sand, and brown medium sand. The surface of all the strata is undulating and results in varying thickness across the valley. A geological sequence is shown on Table E-1, and a geologic profile is shown on Plate E-8. The upland consists of the loess, terrace gravel, Jackson and Claiborne Groups while the valley floor is composed of alluvium and the Claiborne Group. The alluvium stratification is complex changing rapidly from one type of soil to another in both the horizontal and vertical direction As shown on the profile the soil consists of lenses of sand, silt, clay and gravel eroded from the uplands and material transported from further upstream. In the uplands the Jackson Group is termed the "capping clay" and confines the water in the sands of the Claiborne Group, the so-called "500 foot sand", which is a prolific acquifer in this area. The geological history of the area dates back to the last time the ocean occupied the area and deposited the Claiborne and Jackson Groups. As the ocean receded the area became covered by the terrace material due to the outwash at the end of the glacial period. After this the aeolian deposits covered the terrace material. Subsequently, the area was dissected by small streams, tributaries to the Mississippi River, and eroded through the overlaying layers to the top of the Claiborne Group and refilled its valley with alluvium to the present level. The effectiveness of a dam in this area is contingent upon the permeability of the alluvium in the floodplain and the sides of the uplands.

The loess and the capping clay on the uplands have low permeability while the gravel and the 500-foot sand are highly permeable. In the floodplain the alluvium which is composed primarily of the redeposit loess and terrace material from the uplands should have low permeability except for the lenses of gravel. The surface material should serve as a buffer zone between the water behind the dam and the gravel lenses and the 500-foot sand. The side slopes are probably also covered with a sufficient layer of finer grained material to retard seepage. The area is included in the Zone III earthquake area and must be designed to that standard.

3. LIQUEFACTION ANALYSIS

A study was made to determine if the soils in the immediate area of the proposed site for the Nonconnah Creek Dam are susceptible to liquefaction when subjected to earthquake motions. The procedure explained in the report, "A Simplified Procedure for Evaluating Soil Liquefaction Potential", by H. B. Seed and I. M. Idriss, was followed.

The subsurface investigation consisted of taking 23 general sample borings located on or within 5000 feet of the proposed center line of the dam. Blow counts were taken at various depths throughout the majority of the borings. Grain size curves were developed for several sand samples taken from borings. With the exception of two cases, the relative densities (determined from the relationship between standard penetration resistance and relative density of sand developed by Gibbs and Holtz in 1957) for the sandy material exceeded 70 percent. A silty sand shown at a depth of approximately 32 feet in Boring 13 has a relative density of 55 percent and in Boring 18 at a depth of 24 feet the poorly graded sand has a relative density of 65 percent.

Analyses were made in which the depth to sand was assumed to be 10 or 20 feet. The latter seems to be more representative of the overall conditions indicated by the borings. The average mean grain size of the sands was assumed to be 0.2 mm. Calculations were made for which the water table was 5 and 10 feet below the ground surface. Earthquake magnitudes of 7-1/2 (20 significant stress cycles) and 8 (30 significant stress cycles) were studied.

Computed relationships between relative density and maximum ground surface acceleration for which initial liquefaction will just occur for the above conditions are plotted on Plates E-11 through E-12. The results indicate that for combinations of relative density and maximum ground surface acceleration falling above the curves (upper curve for watertable depth of 10 ft. and lower curve for watertable depth of 5 ft.) liquefaction is likely to occur.

Additional analyses were made for five particular soil conditions indicated by borings, blow counts and grain sizes. The conditions analyzed and the results (allowable maximum ground surface accelerations) are shown in Table E-2. The calculations were made for an earthquake of magnitude 8, having 30 significant stress cycles and with the water table 5 feet below the ground surface. With the exception of one case, for which the relative density was 55 percent, the allowable maximum ground surface accelerations exceeded 0.15g. The boring (Boring 13) in which the silty sand was shown having a relative density of about 55 percent was located approximately one mile upstream from the proposed centerline of the dam.

As will be seen when reviewing the boring logs shown on Plates E-1 through E-5, with the exception of the five cases shown in Table E-2, the sands are silty, which according to Messrs. Seed and Idriss are not likely to liquefy as a clean, uniformly graded sand. Boring locations are shown on Plate E-7.

From this study it appears that the majority of the sandy material encountered by subsurface explorations made to date will withstand maximum ground surface accelerations of 0.2g or higher without liquefying.

Hydraulic computations indicate that if the dam were to fail by earthquake action and all permanent storage were lost over a 6 hour period, resulting flows would be within the capacity of downstream channels, and no significant damage would result from flooding.

The probability of ground surface accelerations exceeding 0.2g concurrent with a hydrologic flood are considered remote.

TABLE E-1
GEOLOGICAL SEQUENCE

PERIOD	EPOCH	SUBDIVISION	SOIL CLASSIFICATION
	Recent	Alluvium	clay, silt, sand, gravel
Quaternary	Pleistocene	Loess	silt, fine sand, clay
		Terrace Deposits	brown cherty gravel
	Eocene	Jackson Group	gray & brown clay
Tertiary		Claiborne Group	white fine sand, brown med. sand with lenses of clay

TABLE E-2
ALLOWABLE MAXIMUM GROUND SURFACE ACCELERATIONS

Boring	Mtl	Depth (ft)	N'	N	Dr %	D50 mm	Amax
12-72	SM	17	16	35	71	0.27	0.20
13-72	SM	27	24	40	75	(.2)	0.18
13-72	SM	32	13	22	55	(.2)	0.12
14-72	SM	41	25	39	73	0.16	0.16
18-72	SP	24	18	34	65	0.41	0.17

Note: Values for D50 inclosed in parenthesis were assumed. The values calculated for the maximum ground surface acceleration were determined based on having an earthquake of magnitude 8, 30 significant stress cycles and with the water table 5 feet below the ground surface.

Symbols

N' Actual recorded standard penetration resistance
N Adjusted Standard penetration resistance
Dr Relative Density
D50 Mean Grain Size
Amax Maximum ground surface acceleration

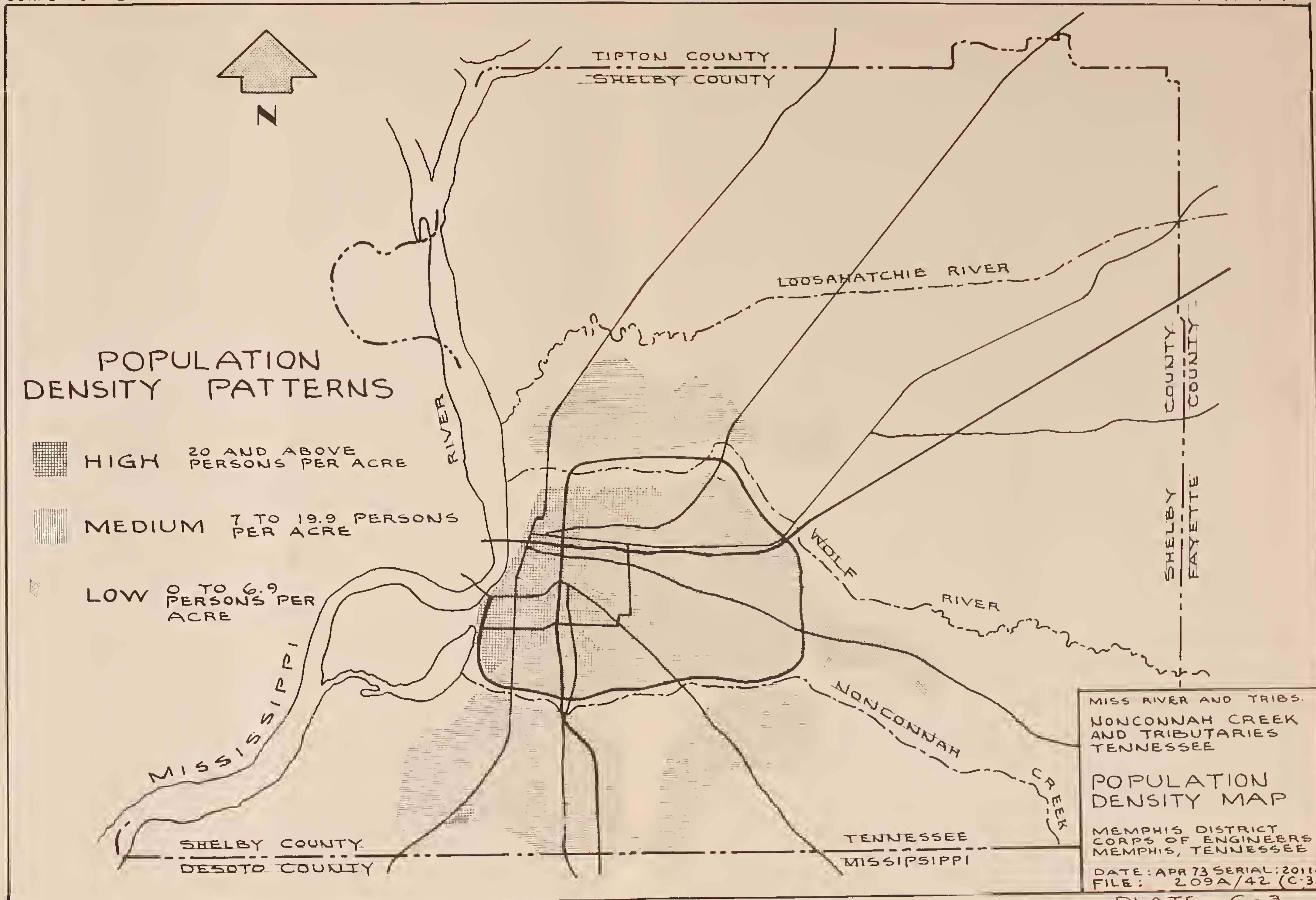
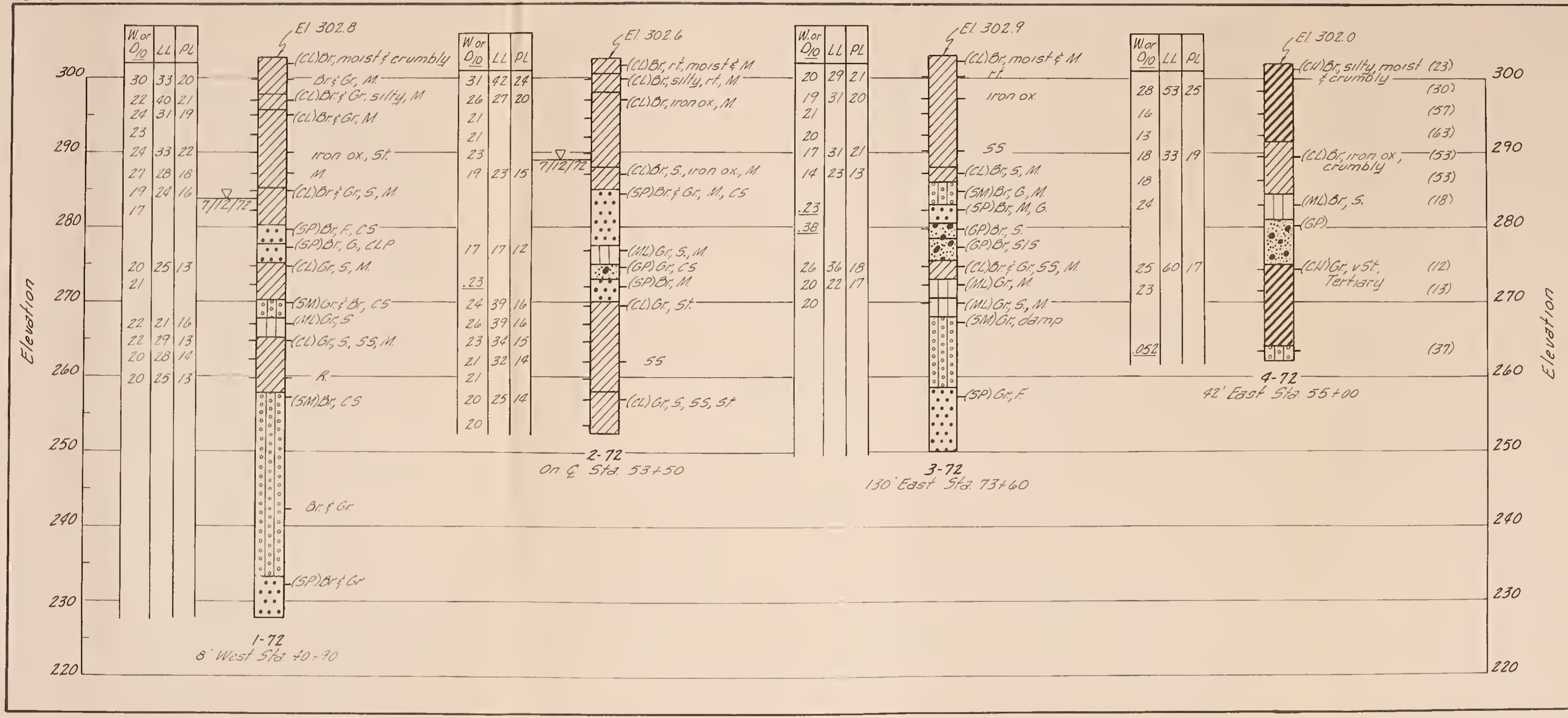

N
POPULATION DENSITY PATTERNS
HIGH 20 AND ABOVE PERSONS PER ACRE
MEDIUM 7 TO 19.9 PERSONS PER ACRE
LOW 0 TO 6.9 PERSONS PER ACRE
TIPTON COUNTY
SHELBY COUNTY
LOOSAHATCHIE RIVER
RIVER
WOLF RIVER
SHELBY COUNTY
FAYETTE COUNTY
MISSISSIPPI
NONCONNAH CREEK
SHELBY COUNTY
DESOTO COUNTY
TENNESSEE
MISSISSIPPI
MISS RIVER AND TRIBS.
NONCONNAH CREEK AND TRIBUTARIES TENNESSEE
POPULATION DENSITY MAP
MEMPHIS DISTRICT CORPS OF ENGINEERS MEMPHIS, TENNESSEE
DATE: APR 73 SERIAL: 20114
FILE: 209A/42 (C-3)

PLATE C-3

CORPS OF ENGINEERS

U. S. ARMY

PLATE C-5



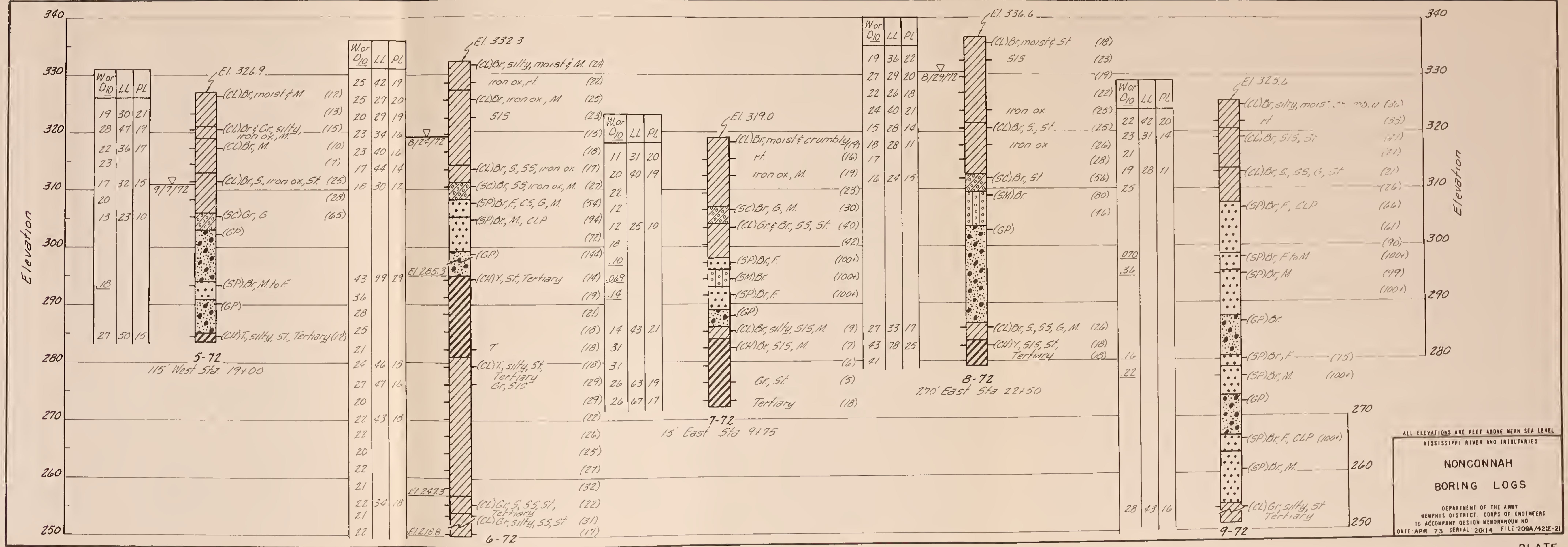
ALL ELEVATIONS ARE FEET ABOVE MEAN SEA LEVEL

MISSISSIPPI RIVER AND TRIBUTARIES

NONCONNAH

BORING LOGS

DEPARTMENT OF THE ARMY
MEMPHIS DISTRICT, CORPS OF ENGINEERS
TO ACCOMPANY DESIGN MEMORANDUM NO.
DATE: APR 73 SERIAL 20114 FILE: 209A/42(E-1)

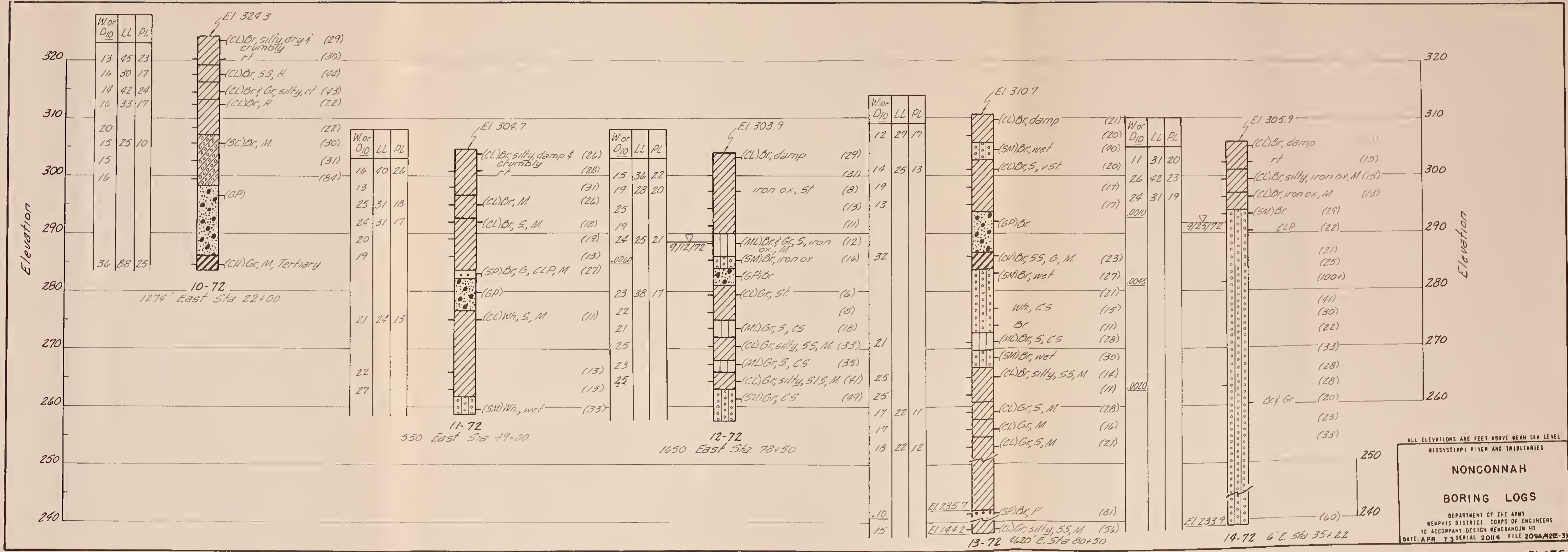


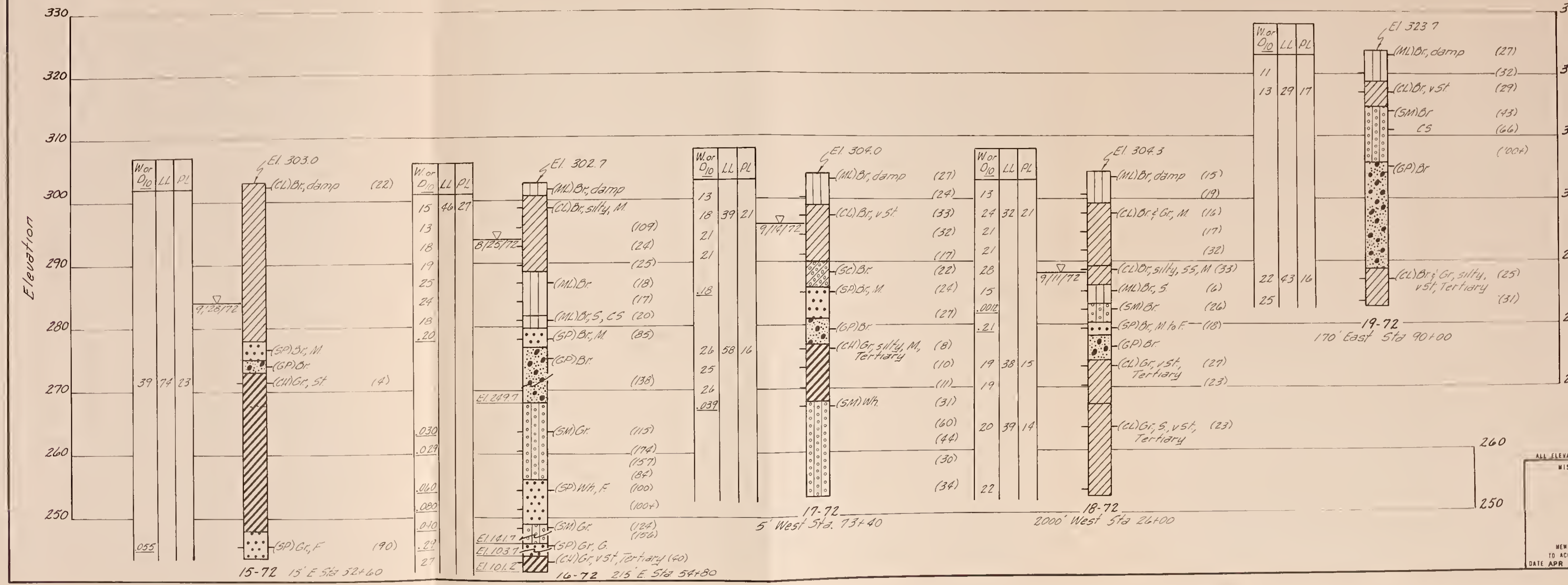
MISSISSIPPI RIVER AND TRIBUTARIES

NONCONNAH

BORING LOGS

DEPARTMENT OF THE ARMY
MEMPHIS DISTRICT, CORPS OF ENGINEERS
TO ACCOMPANY DESIGN MEMORANDUM NO
DATE: APR 73 SERIAL 20114 FILE 209A/42(E-2)


Elevation
El. 324.3
10-72
1274' East Sta 22+00
El. 304.7
11-72
550' East Sta 29+00
El. 303.9
12-72
1650 East Sta. 78+50
El. 310.7
13-72
4620' E. Sta 80+50
El. 305.9
14-72
6' E. Sta 35+22
W. or D_{10}
LL
PL
ALL ELEVATIONS ARE FEET ABOVE MEAN SEA LEVEL
MISSISSIPPI RIVER AND TRIBUTARIES
NONCONNAH
BORING LOGS
DEPARTMENT OF THE ARMY
MEMPHIS DISTRICT, CORPS OF ENGINEERS
TO ACCOMPANY DESIGN MEMORANDUM NO
DATE APR 73 SERIAL 20114 FILE 209A/42(E-3)



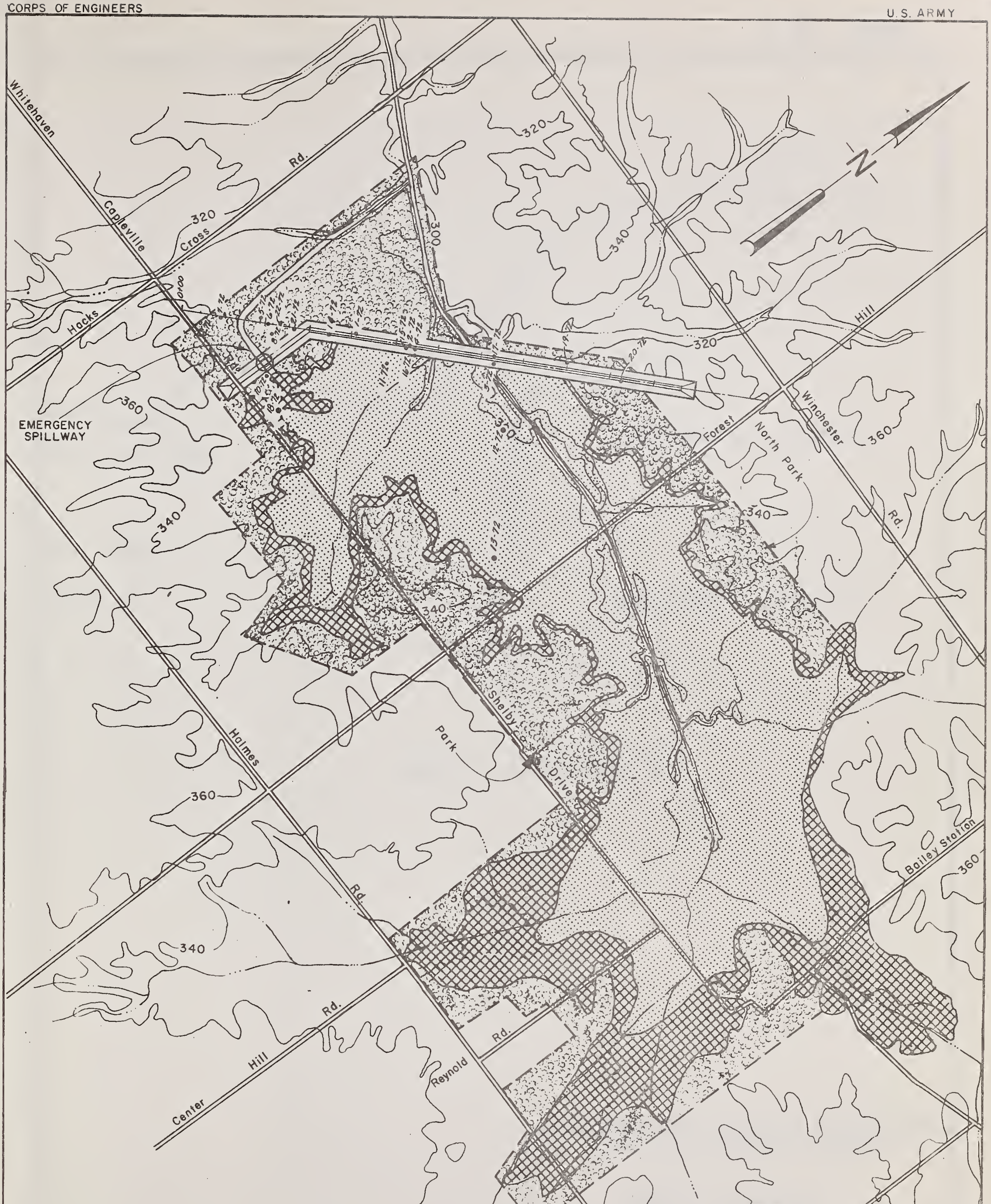
ALL ELEVATIONS ARE FEET ABOVE MEAN SEA LEVEL

MISSISSIPPI RIVER AND TRIBUTARIES

NONCONNAH

BORING LOGS

DEPARTMENT OF THE ARMY
MEMPHIS DISTRICT, CORPS OF ENGINEERS
TO ACCOMPANY DESIGN MEMORANDUM NO
DATE APR 73 SERIAL 20114 FILE 209A/42(E-4)



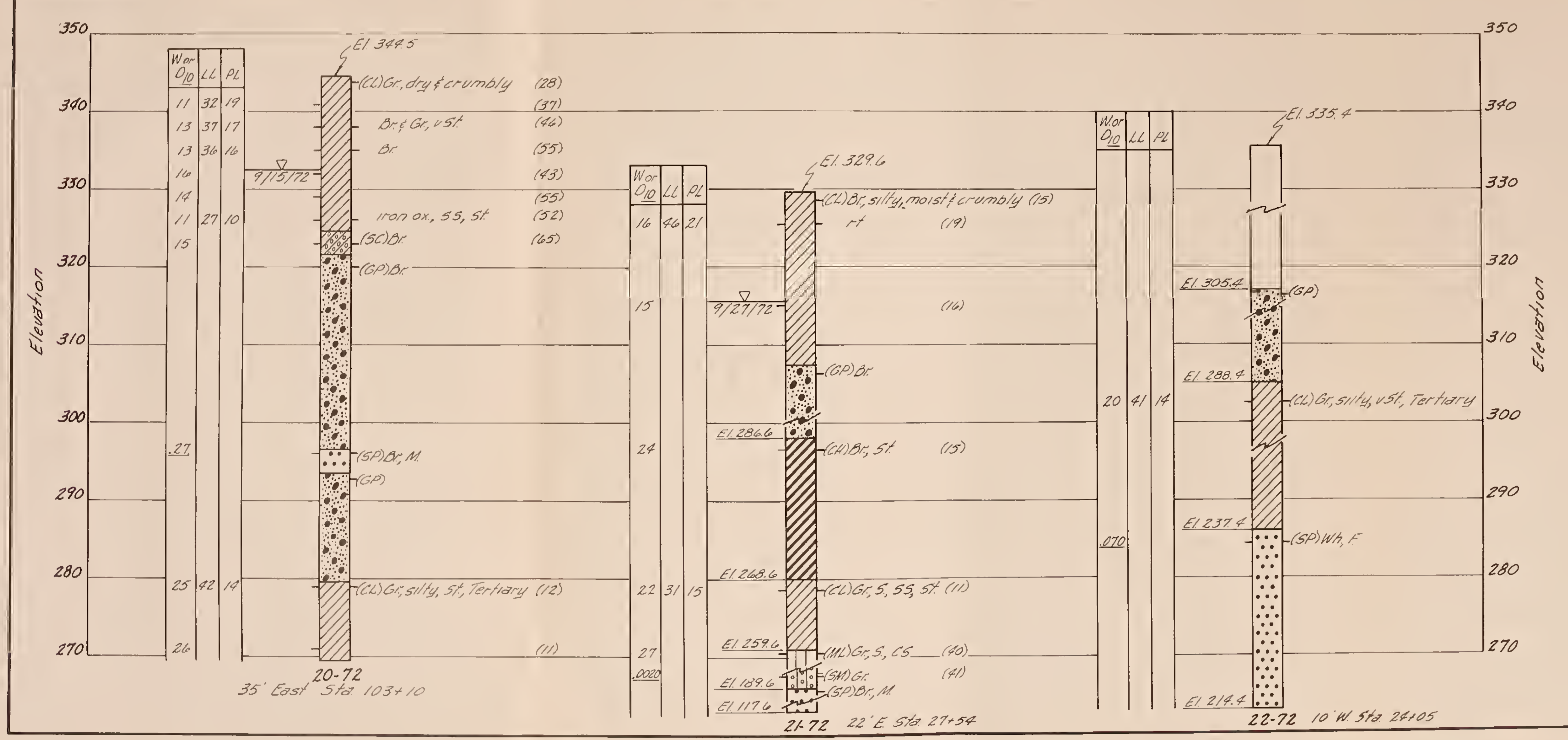
MISS. RIVER TRIB.

NONCONNAH CREEK & TRIBUTARIES
TENNESSEE

BORING LOCATION

PREPARED BY
MEMPHIS DISTRICT, CORPS OF ENGINEERS
MEMPHIS, TENNESSEE

DATE: APR. 73 SERIAL: 20114 FILE 209A/42(E-7)



ALL ELEVATIONS ARE FEET ABOVE MEAN SEA LEVEL

MISSISSIPPI RIVER AND TRIBUTARIES

NONCONNAH

BORING LOGS

DEPARTMENT OF THE ARMY
MEMPHIS DISTRICT, CORPS OF ENGINEERS
TO ACCOMPANY DESIGN MEMORANDUM NO.
DATE APR 73 SERIAL 20114 FILE 209A/42(E-5)

PLATE E-5

CORPS OF ENGINEERS

U.S. ARMY

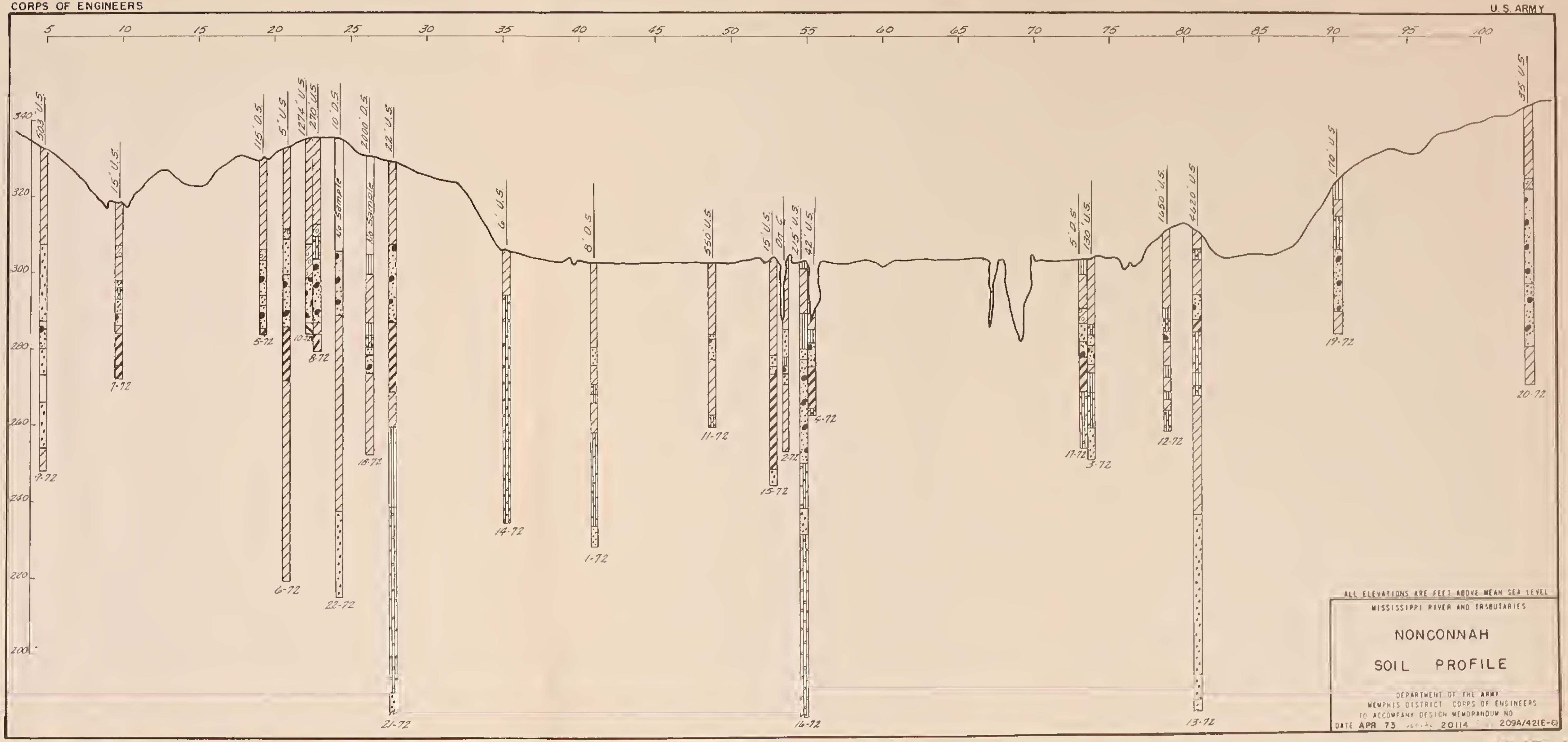
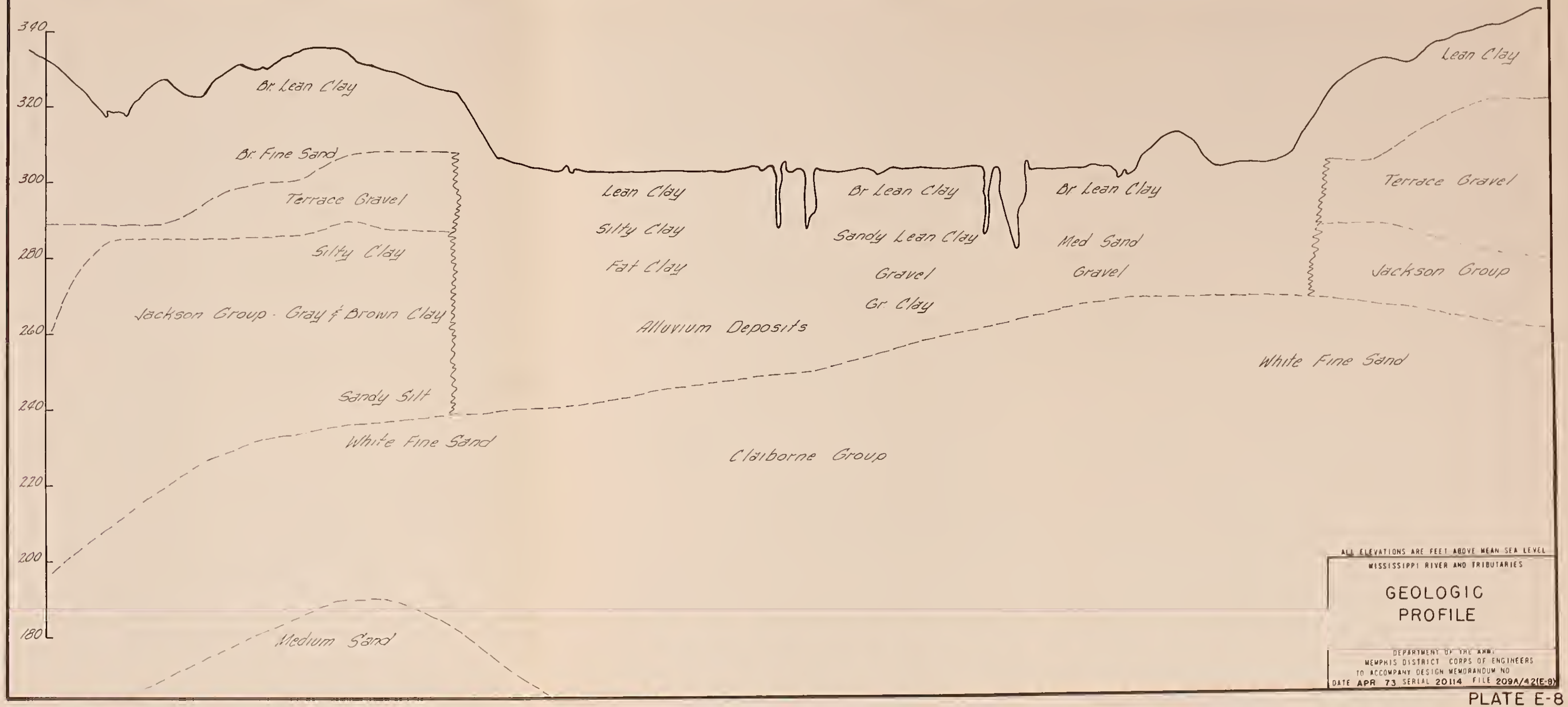


PLATE E-6

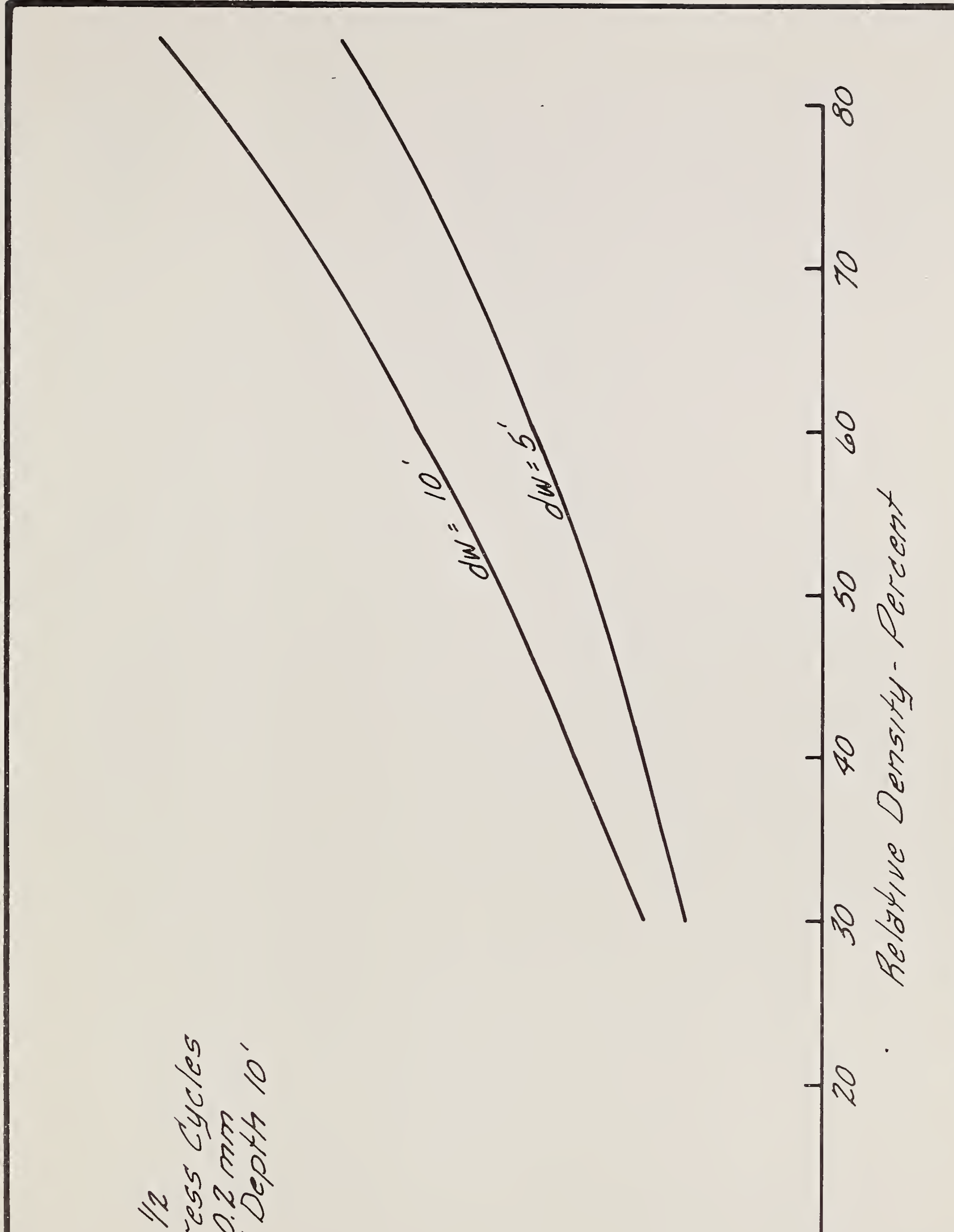


ALL ELEVATIONS ARE FEET ABOVE MEAN SEA LEVEL

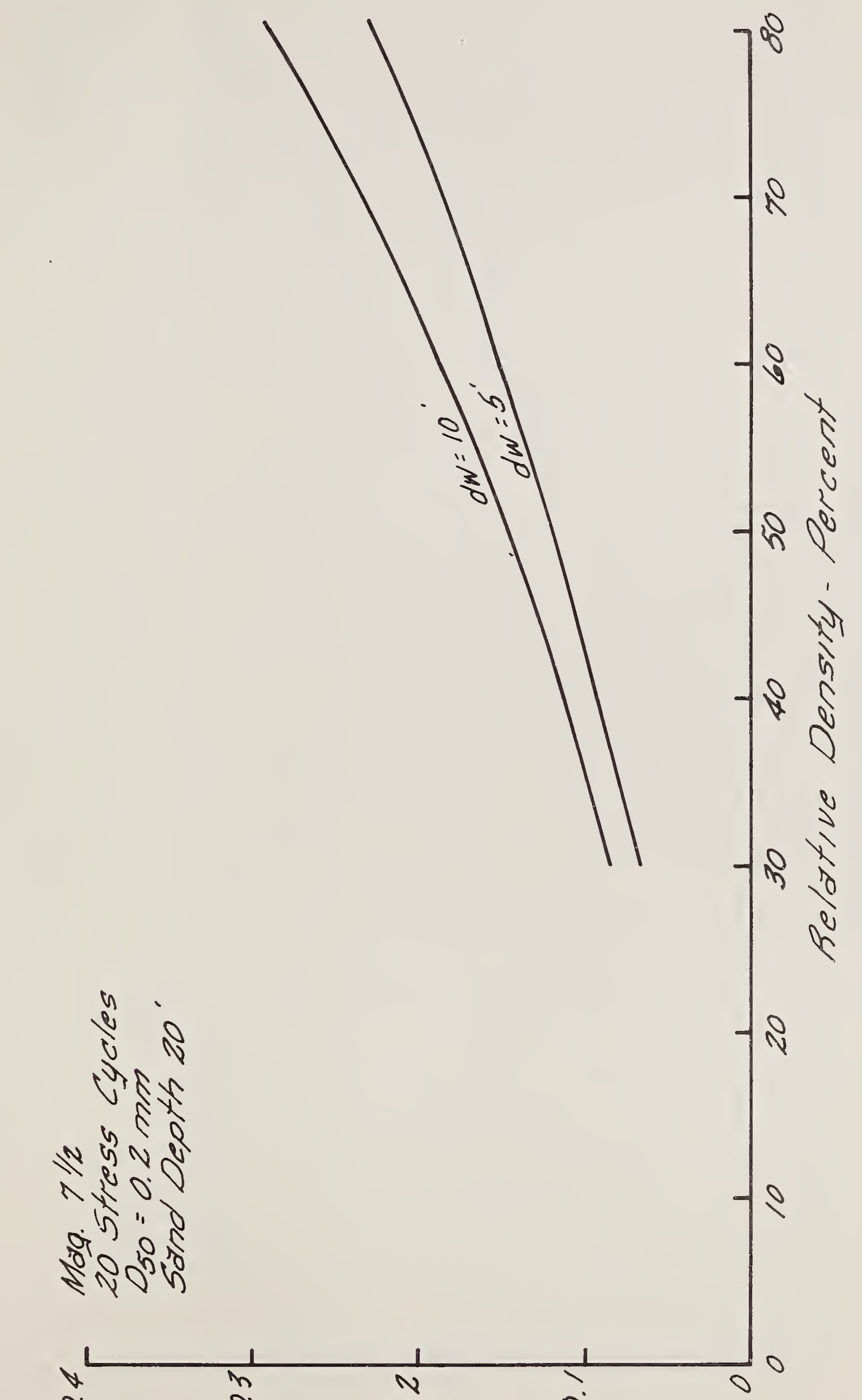
MISSISSIPPI RIVER AND TRIBUTARIES

GEOLOGIC PROFILE

DEPARTMENT OF THE ARMY
MEMPHIS DISTRICT CORPS OF ENGINEERS
TO ACCOMPANY DESIGN MEMORANDUM NO
DATE APR 73 SERIAL 20114 FILE 209A/42(E-8)

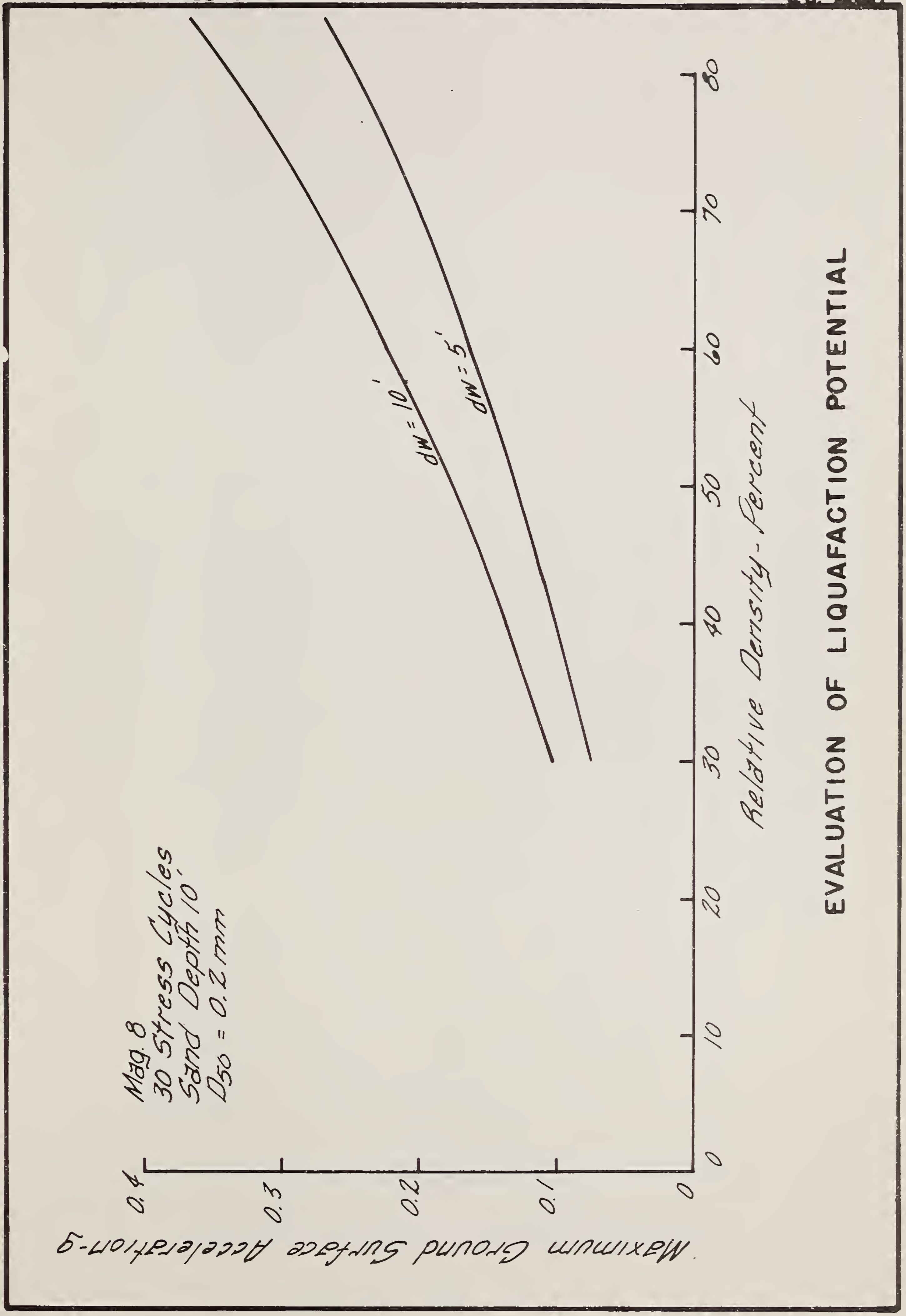


EVALUATION OF LIQUAFACTION POTENTIAL



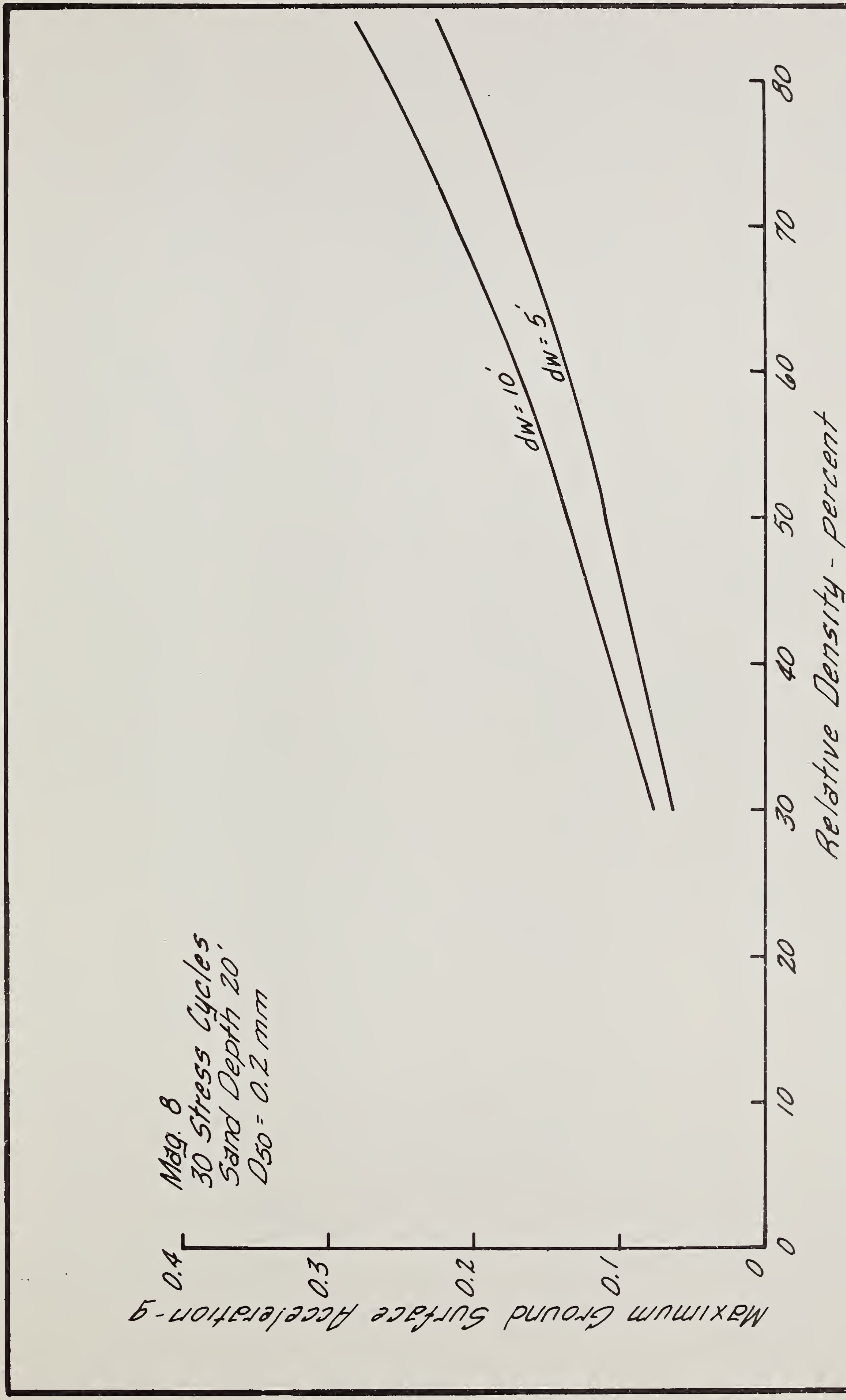
EVALUATION OF LIQUAFACTION POTENTIAL

CORPS OF ENGINEERS U.S. ARMY



EVALUATION OF LIQUAFACTION POTENTIAL

PLATE E-11



EVALUATION OF LIQUAFACTION POTENTIAL

APPENDIX F

INVESTIGATION AND ANALYSES
BY
SOIL CONSERVATION SERVICE

INTERIM REPORT

NONCONNAH CREEK WATERSHED

GENERAL INVESTIGATION STUDIES

APPENDIX F

INVESTIGATION AND ANALYSES BY SCS

Initial investigations of the Nonconnah Creek Watershed were made by the Soil Conservation Service. These and subsequent investigations by SCS are described as follows in this appendix. Investigations made by the Corps of Engineers after its participation in the project are described elsewhere in the report.

Engineering Surveys. The engineering surveys on Nonconnah Creek Watershed consisted of establishing about 250 miles of vertical control, surveying approximately 225 valley, channel and road and bridge sections and preparation of topographic maps for 10 structures. Vertical control was established in feet with an elevation tolerance of 0.10 times the square root of the distance in miles. Mean sea level was used as the control datum.

Topographic maps of the floodplains on the main stem, Johns Creek, Days Creek, and portions of Ten Mile Creek, Black Bayou, Cane Creek, and Cherry Branch were prepared by the Soil Conservation Service Cartographic Unit, using photogrammetry with a contour interval of 2 feet. Vertical control for these maps was run by the SCS River Basin Survey team.

The valley cross sections were surveyed at selected locations to determine valley shape, width, and other hydraulic characteristics for floodrouting purposes. Topographic maps of 7 reservoir sites covering approximately 9,000 acres were prepared with a contour interval of 4 feet by an SCS survey team using a plane table and telescopic alidade. Stage storage and stage area data were developed from these maps as well as from Memphis 5-foot contour maps.

Design. Eighteen floodwater-retarding structure sites were evaluated in several combinations prior to Corps of Engineers participation in planning. Three sites were selected on Johns Creek as providing the most feasible and effective program for the Johns Creek floodplain. Preliminary design of the three single-purpose structures was based on design criteria contained in Engineering Memorandum SCS-27 (Revised), dated March 19, 1965. Structure classifications were made from a field review of the proposed structure locations.

Storage of the expected 100-year sediment accumulation is provided in each of the structures. Sediment distribution in the

structure sites was determined using procedures outlined in Technical Release-12 (Revised), dated January 1968.

Detention volume requirements for all structures were determined from computer routings of the principal spillway hydrographs. The principal spillways and intakes are proportioned such that flows through the emergency spillways will have less than a 1 percent chance of occurrence. Structure No. 15 was designed with a two-stage principal spillway. The storage between the high and low stages of the two-stage riser is the volume of runoff from the 5-year, 24-hour rainfall taken from U. S. Weather Service TP-40. Structures 11 and 17 were designed with single-stage principal spillways.

The flowage easement and top of dam elevations were determined from computer routings of the design and freeboard hydrographs.

Hydrologic. Water surface profile for 113 valley cross sections were developed by using the IBM-1130 electronic computer. Composite roughness coefficients were selected to represent future conditions of the present channel and future valley conditions. Drainage areas upstream from each valley cross section were planimetered from a base map of the watershed. Distances between sections were also obtained from the base map. The stage-discharge relationships for these sections reflect the conditions of the valley that most likely will exist after complete urbanization of the floodplain takes place.

Rainfall data were obtained from the U. S. Weather Service Technical Paper-40 and local precipitation gage records. A 24-hour storm duration was used for all synthetic storms in the evaluation and a runoff curve number of 80 was applied in computing storm runoff. Rainfall was distributed by using the SCS Type II storm distribution. Approximately 38 percent of the total rainfall for each storm frequency was assumed to have fallen during a 30-minute period, about 11 hours after the rainfall began. The maximum 60-minute intensity applied was 45 percent of the total rainfall. The intensities incorporated in the Type II storm distribution compare very favorably with actual intensities recorded for the U. S. Weather Service rainfall gage at Memphis, Tennessee.

The watershed was divided into hydrologic units with drainage areas ranging in size from one-half to 18 square miles. The average size of the hydrologic units was about 3 square miles. Curvilinear unit hydrographs were developed for these areas and runoff amounts were applied and distributed in 30-minute intervals. The resulting runoff hydrographs were floodrouted downstream through the next hydrologic unit. Local inflow hydrographs were added either at the upper end of the reach and routed through the reach or added at the

lower end of the reach, depending on the characteristics of each. All floodrouting was done by using the IBM electronic computer at Fort Worth, Texas. The "Convex Method" of floodrouting, as outlined in Chapter 17, Section 4 of the National Engineering Handbook, was used.

Floodwater-retarding structural combinations were evaluated by using the 100-year, 24-hour rainfall to determine the combination of structures that would offer the best degree of flood protection. The system of structures proposed was evaluated by floodrouting seven storm frequencies to determine flow-frequency relationships for use in the economic evaluation.

Geologic Investigations. Preliminary geologic investigations were made at the proposed dam sites to determine geologic feasibility and to note any unusual conditions that would require special design considerations. Investigations were carried out through observation of surface conditions and inspection of soil outcrops in gullies, stream channels, and road cuts. Geologic and soil maps and reports were reviewed to gain additional information on the location, extent, and composition of formations in the area.

Five floodwater-retarding recreation dams were recently investigated, tested, and designed for the Shelby County Conservation Board. These sites are located near the Nonconnah Creek Watershed and are in the same physiographic area and the same geologic formations. Case files of dams constructed in the Sand-Mary's Creek pilot watershed were also reviewed. All dam sites are geologically feasible. No serious seepage problems are expected due to presence of coarse grain materials. No out-of-the-ordinary testing or above normal construction costs are anticipated. Foundation and/or embankment drains will be necessary to control seepage and uplift pressures. All of the proposed dam sites are fairly dry and well drained. Some borrow materials may be available from the floodplain area of the reservoirs. The location of additional borrow areas will be along valley slopes and abutments. Emergency spillways will be excavated in highly-erosive loess soil (ML-CL) as is common in this area.

Open pit mining of terrace gravels is being actively pursued in the watershed. Any possible mining and placement of overburden materials could change the topography of the dam sites. Future high sediment production from these mining areas will adversely affect the sediment storage allotment and must be controlled.

Detailed geologic investigation will be needed prior to final design and construction of the proposed dams. The investigations are needed to delineate in detail the foundation conditions, locate borrow areas and determine the types of materials in the emergency spillway areas.

Fish and Wildlife. Study and analysis of the Nonconnah Creek Watershed in Shelby and Fayette Counties in Tennessee and DeSoto and Marshall Counties in Mississippi was made by biologists of the Tennessee Game and Fish Commission, U. S. Fish and Wildlife Service, and Soil Conservation Service. A field investigation of the watershed was conducted September 14, 15, and 16, 1970. An aerial study was also made on September 16, 1970. Identification, location, and evaluation of the fish and wildlife resources in this watershed were determined through interviews and correspondence with the local Tennessee Game and Fish Commission Officer and the SCS District Conservationist and through direct onservations plus comparisons of this watershed with similar watersheds in West Tennessee.

Sedimentation. Calculations of gross sheet erosion were made through the use of Musgrave soil loss predicting equation. Factors considered in this equation are land use and cover condition, percent and length of slopes, maximum 2-year, 30-minute frequency rainfall, and the basic erosion rates of the soils involved. Primary consideration was also given to changes anticipated in future land use and treatment. The Shelby County Planning Commission has projected that most of the Nonconnah Creek Watershed will change from agricultural use to urban-industrial development by the year 2000. In view of this, sediment storage requirements were calculated for each site with the present land use and future land use changes. Streambank, gully, and roadside erosion was estimated by approved methods.

Procedures outlined in Technical Release No. 12 (Rev.) SCS, Engineering Division, January 1968, were used to determine the sediment storage requirements of the proposed structures. After obtaining the land use above 8 representative structure sites, detailed calculations of the average annual sheet erosion rates for the various types of land use were made. These computed rates were considered to be representative of the watershed and were used to determine the average annual sheet erosion rates for all other sites. Future rates were calculated on projected land use changes from agriculture to urban-industrialization. High erosion rates were used for the increment of years in which this conversion was projected to take place. These increments of years varied somewhat from site to site, depending upon the site location and the amount of conversion which is projected to take place. Other factors considered in

calculating the required sediment storage capacity for a particular structure included the percent of eroded material to be delivered to the structure, the trap efficiency of the reservoirs, the volume weight of the deposited sediment, and the distribution of this sediment within the reservoir area.

Detailed investigations of various portions of the floodplain found little or no damages caused by deposition of less fertile sediment. This is due to the relatively low rate of upland erosion at the present and also the very similar textures of the new deposition and present floodplain soils. No swamping damages were found except those caused by the construction of fixed improvements.

Reductions in erosion are claimed for the future on lands now in agricultural use. Inasmuch as these lands are simply "awaiting their turn" to be converted, it was felt that landowners will be reluctant to adopt many conservation practices; therefore, an effective land treatment program will require an intensive education and information program. It is expected that after this land has changed to urban-industrial use that upland erosion on these acres will not occur. Erosion rates will be high during the changeover or construction period if suitable standards are not developed and enforced by the city and county governments.

Land Use and Treatment. The Conservation Needs Inventories for Shelby County, Tennessee and Marshall and DeSoto Counties, Mississippi provided a guide for determining the land use and conservation treatment needs. Information was also obtained from aerial photographs and by consultation with the local district conservationist, Memphis and Shelby County Planning Commission, Shelby County Conservation Board, and others. Land use and treatment needs of the floodplain were determined by the local district conservationists, Memphis and Shelby County Planning Commission staff, and field inspection.

Soil surveys on the Nonconnah Creek Watershed have been made by soil scientists of the Soil Conservation Service. This mapping shows the soil type, slope, and degree of erosion.

Critical sediment-producing areas were delineated from aerial photographs and spot checked in the field for accuracy. Roadside critical area was determined by field mapping.

The amount of land treatment now on the ground was determined from farm plans, plus field checks. The land treatment measures to be installed were determined from total needs of the watershed. These needs were then discounted to show only the amounts that can reasonably be applied.

Only those land treatment measures that have a measurably physical effect in reducing floodwater, sediment, or erosion damage are included in the work plan.

Forestry. A systematic field survey showed ground cover, forest and hydrologic conditions, and treatment needs. The survey, supporting data, and information from other agencies and forestry officials served as a basis for the proposed remedial measures. The measures recommended contribute to flood reduction and soil stabilization. The forest land treatment measures planned on private land are limited by the expected participation and the length of the installation period.

Economics. Floodwater damages and benefits were determined using the stage-damage method of analysis and were computed for each reach using the 1130 version of the ECON-2 computer program. Present land use and values of buildings, contents and utilities were established on the urbanized floodplain. Future development in the floodplain was projected and potential damages and benefits were determined by applying information from known to unknown areas on an average annual basis.

Due to a lack of flood-damage information, the last flood of record having occurred in 1958 when less than 10 percent of the floodplain was developed with urban properties, published depth-damage relationships for residential, commercial, industrial, utilities, contents, and street and bridge were used after modifying for Memphis conditions. These adjustments include modifications for type of structures, furnishings, heating and cooling plants, utility and laundry facilities and construction or replacement costs. Data used included residential and other urban damage factors from the Philadelphia-Baltimore area, and preliminary national average curves from HUD for flood insurance studies.

Local authorities including the Memphis and Shelby County Planning Commission, City and County Engineers' offices, local authorities responsible for zoning and building codes and ordinances, landowners, developers, builders, and realtors were consulted concerning the developments, uses and values of present and projected conditions in the Nonconnah Creek Watershed, with special consideration of the floodplain use. It was a consensus of opinion that present development policy was generally following the recommendations of the Flood Plain Information Report - Nonconnah Creek, Shelby County, Tennessee, published by the Soil Conservation Service, July 1968. This policy generally consists of setting aside a 300-foot opening along each side of the centerline of the channel and establishing

curb elevation of streets at the elevation of the 100-year frequency flood, plus 1.0 feet, using present flood plain conditions. Zoning regulations then are changed from agricultural (flood) to some higher type of use which allows for permanent type of buildings including subdivisions, multi-dwellings, apartments, commercial, and industrial. Evaluations were made on all properties presently developed and projections were made to reflect average conditions that could be expected to occur during the lifetime of the project. Such development was assumed to be completed by 1980. Damageable values were projected using the assumption that present mix and recent developments (last 5 years) are reflective of future developments. Adjustments were made to reflect more rigid restrictions on new areas, differences in depths of flooding and damage sustained and area involved. This approach allowed the use of appraised damages from the known to unknown areas on an average annual basis.

Values of all properties were projected to increase over the 100-year evaluation period. Building prices have increased significantly during the past several years and all evidence indicates that this will continue. Therefore, it was assumed that the wage per hour component of housing would continue to increase in value. Due to efficiencies that may occur in the building industry such as prefabrication and other labor-saving methods, increases were held to 50 percent of the OBE wage rate projections which were used to make these adjustments.

The damages and benefits for floods through the 100-year event were evaluated for this analysis. Future conditions (1970 with projections to 1980) without project and future conditions with project were evaluated. Flood frequencies of 100, 50, 25, 10, 5, and 2 years were used.

Agricultural benefits were analyzed on the crop and pasture land on a composite acre and season-of-flooding basis. Agricultural losses such as debris removal, fence damages, and other losses were studied on a per-flooded-acre basis. Due to the changing economy from agricultural to urban, low frequency of flooding and presene land use patterns, these damages were extremely small and compose less than 1 percent of total benefits.

Indirect damages are considered as costs resulting from such things as rerouting traffic, interrupted services, delayed delivery, increased depreciation of sewer lines, storm drains, streets, curbs and gutters, sidewalks, and reduction in production. These damages were estimated to be 20 percent of residential damages and 25 percent of commercial and industrial damages.

A 1972 price base was used as the basis for installation costs. The costs of land rights were developed in meetings with the watershed sponsors and based on current real estate sales in the watershed. The unit costs of roads and bridges were developed in meetings with county officials.

APPENDIX G

PERTINENT CORRESPONDENCE

INTERIM REPORT

NONCONNAH CREEK BASIN
GENERAL INVESTIGATION STUDIES

APPENDIX G

1. GENERAL

The exhibits presented in this appendix include letters and records of coordination with Federal, State, and local agencies. A discussion of coordination with other agencies is presented in Section XVI of the interim report.

2. FEDERAL AGENCIES

Correspondence with Federal agencies presented in this Appendix include:

<u>Correspondence</u>

Fish & Wildlife Service Letter, 2 July 1973
Fish & Wildlife Service Letter, 5 June 1973
Fish & Wildlife Service Report, 6 October 1972
Bureau of Outdoor Recreation Report, 1 June 1973

Comments of these agencies are discussed in paragraphs 68 and 69 of the interim report.

3. STATE AGENCIES

Records of coordination with the State of Tennessee included in this appendix include:

Letter from Governor, 6 July 1973
Record of Conference with State Agencies, 23 July 1973
Record of Meeting with Governor, 2 August 1973

In addition, comments of the Tennessee Game and Fish Commission and the State Naturalist are included as attachments to the Fish and Wildlife Report dated 6 October 1972.

4. REGIONAL AGENCIES

Correspondence from regional agencies included in this appendix include:

Chickasaw Basin Authority Letter, 14 September 1973
(Local Sponsor)
Mississippi-Arkansas-Tennessee Council of Governments - Letter dated 24 August 1972

5. LOCAL AGENCIES

Correspondence from local agencies included in this appendix include:

Memphis and Shelby County Planning Commission Letter, 30 May 1973
Letter from Mayor of Memphis, 17 October 1973
Letter from the Shelby County Court, 23 October 1973

Also included as attachments to the Mississippi-Arkansas-Tennessee Council of Governments letter dated 24 August are comments of the Shelby County Engineer and the Environmental Action Council of Memphis.

United States Department of the Interior
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
17 EXECUTIVE PARK DRIVE, N. E.
ATLANTA, GEORGIA 30329

AIRMAIL

July 2, 1973

District Engineer
U.S. Army Corps of Engineers
668 Federal Office Building
Memphis, Tennessee 38103

Dear Sir:

Reference is made to our letter of June 5, 1973, concerning our review of a report and preliminary draft environmental statement on the Nonconnah Creek Basin in Tennessee. The last sentence of this letter recommended inclusion of a Bureau of Sport Fisheries and Wildlife report in Appendix G of your report. The correct date of this Bureau report is October 6, 1972, instead of December 8, 1971, as stated in our June 5 letter.

Sincerely yours,

C. Edward Carlson

Regional Director

United States Department of the Interior
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
17 EXECUTIVE PARK DRIVE, N. E.
ATLANTA, GEORGIA 30329

June 5, 1973

District Engineer
U.S. Army Corps of Engineers
668 Federal Office Building
Memphis, Tennessee 38103

Dear Sir:

Reference is made to your letter of April 18, 1973, addressed to Mr. Paul Smith, Bureau of Sport Fisheries and Wildlife, Vicksburg, Mississippi, concerning the draft report and preliminary environmental impact statement on the Nonconnah Creek Basin.

Since this is a preliminary draft environmental impact statement and was not routed through normal channels for official review and comments, our letter does not constitute official comments of the Bureau of Sport Fisheries and Wildlife. However, we have reviewed the subject report and environmental impact statement and find that adequate consideration has been given to fish and wildlife aspects of work to be accomplished by the Corps of Engineers. Our only comment is that the Bureau of Sport Fisheries and Wildlife's report of ~~December 8, 1971~~, on the Corps' plans should be included in Appendix G of the report.

October 6, 1972

Sincerely yours,

Jack E Hemphill

Deputy Regional Director

United States Department of the Interior
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
PEACHTREE-SEVENTH BUILDING
ATLANTA, GEORGIA 30323

October 6, 1972

District Engineer
U.S. Army, Corps of Engineers
Memphis, Tennessee

Dear Sir:

Reference is made to your letter, LMMED-PF, dated April 28, 1972, requesting our comments on your proposed plans for flood control and recreation in the Nonconnah Creek Basin in Shelby County, Tennessee. These plans are a part of the Wolf and Loosahatchie Rivers and Nonconnah Creek project, Mississippi and Tennessee. Your studies for this project were authorized by the Committee on Public Works of the United States by resolution of October 28, 1970, directing the Chief of Engineers to review previous reports on the Mississippi River and Tributaries project to determine the advisability of modifying previous recommendations. Our studies have been conducted in cooperation with the Tennessee Game and Fish Commission and in accordance with the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and Section 102(2)(C) of the National Environmental Policy Act of 1969.

Nonconnah Creek rises about 5½ miles west of Mt. Pleasant, Mississippi, and flows westward through suburbs and the city of Memphis, Tennessee, before emptying into Lake McKeller which in turn is connected to the Mississippi River. The 117,300-acre watershed is located in the Gulf Coastal Plain physiographic province. According to land use data provided by the U.S. Soil Conservation Service, about 39,882 acres of the area are cropland, 5,865 acres are woodland, 19,941 acres are pasture and idle land, and 46,920 acres are urbanized. Approximately 9,400 acres of the areas are inundated by floods of a 100-year frequency.

The Bureau previously examined plans for a Public Law 566 project designed by the Soil Conservation Service known as the Nonconnah Creek Watershed project. Essentially, the plans proposed by the Soil Conservation Service were for construction of five floodwater-retarding structures with permanent pools ranging in size from 47 to 1,900 surface acres and totaling 2,572 acres; brushing and snagging below the top of channel banks for a distance of 19,000 linear feet; provisions for a constant release of water from the multiple-purpose structure equivalent to 0.05 cubic feet per second per square mile of drainage to maintain base flows; construction of eight timber

overfall structures in the channel; and land-treatment measures. Flood pools for the proposed reservoirs would have a total surface area of 5,592 acres. One of the proposed reservoirs, at a location designated as site 3, approximately 20 miles upstream from the mouth of Nonconnah Creek was to have a 1,900-acre conservation pool and contain storage for recreation.

DESCRIPTION OF THE PROJECT

Project features presently being considered by your staff for the Nonconnah Creek Basin include construction of a 1,900-acre multiple-purpose reservoir at approximately the same location as site 3 in the Soil Conservation Service's small watershed project. The dam will intercept runoff from about 22,800 acres. Channel dimensions will be increased downstream from John's Creek. A greenway 300 feet each side of the centerline of the channel will extend from the mouth of Nonconnah Creek to the proposed multiple-purpose reservoir. The proposed reservoir and greenway will provide flood control and recreational benefits. The extent to which the channel will be enlarged has not yet been determined, although your letter of April 28, 1972, indicated it will likely be designed to prevent overbank floods of less than 100-year frequency. Purchase of approximately 5,000 acres of right-of-way will be necessary for construction and operation of the reservoir. The State of Tennessee has authorized development of a State park adjacent to the reservoir. Two alternative operational procedures are being considered for the proposed reservoir which will be designated as plans A and B in this report.

Alternative Plans for Nonconnah Creek Multiple-Purpose Reservoir

	Elevation (m.s.l.)	Area (acres)	Volume (acre-feet)
Plan A			
Flood control pool	326.0	3,275	30,100
Conservation pool	318.8	1,900	13,100
Plan B			
Flood control pool	323.3	2,650	23,050
Conservation pool			
During period May-Aug.	318.8	1,900	13,100
During period Sept.-Apr.	314.2	1,200	6,195

FISH AND WILDLIFE RESOURCES

Much of the area has been cleared and is used for urban and agricultural purposes, although there is a potential for development to provide for recreational needs. According to an environmental inventory prepared by Memphis State University, a few

species of flora are present that are regarded as rare or endangered. The only records of Dracopis amplexicaulis and Franseria acanthacarpa in the State of Tennessee are from the proposed site for the project greenway. The white dog tooth violet (Erythronium albidum) found in the area that will be inundated by the reservoir has been found in only one other locality in Shelby County, Tennessee. Toothcup (Ammania auriculata) occurs below the damsite and is known to be present in only one other locality in western Tennessee. Rare or endangered fauna that may be present include the southern bald eagle, American peregrine falcon, red-cockaded woodpecker, and Indiana bat.

Fishing and hunting pressure in the project area is of low to moderate intensity. Streamflow sometimes approaches zero and municipal and industrial pollution often becomes severe; consequently, there is little desirable stream fish habitat. Deeper pools in the upper reaches of Nonconnah Creek, however, contain a small population of largemouth bass, bluegill, other sunfishes, catfishes, minnows, and suckers. Woodlands and agricultural areas support a few white-tailed deer, squirrels, rabbits, raccoon, opossum, bobwhite quail, and mourning dove. When flooding occurs during fall and winter, inundated areas provide resting and feeding opportunities to migrating waterfowl of the Mississippi Flyway.

We anticipate a continued decline in quantity and quality of wildlife habitat. Increased pollution from municipal and industrial sources could also occur with greater urbanization that would degrade the quality of the habitat for fish and wildlife. The need for fishing, hunting, and other outdoor recreational opportunities in the area exceeds the present capacity, and demands for such needs are certain to increase as the human population increases.

PROJECT EFFECTS AND MITIGATION PLAN

With the project, opportunities for sport fishing and wildlife oriented recreation will be improved, although habitat for some species of wildlife will be degraded. Habitat for certain unique species of vegetation could also be destroyed or significantly altered. About 1,900 acres of wildlife habitat will be inundated by the conservation pool of the proposed reservoir. Reduced flooding downstream from the reservoir will also diminish the area's attraction to migratory waterfowl. On the other hand, the reservoir will provide sport-fishing opportunities and the proposed park surrounding the reservoir and greenway will offer wildlife-oriented recreation opportunities.

The operational plan for lowering the conservation pool in the fall of the year, referred to as plan B, would be more desirable than plan A in regard to managing the reservoir fishery resource. Lowering the pool in the fall of the year would aid in controlling aquatic vegetation and concentrate fish in a smaller area where the predator and prey relationship would tend to adjust the size and species composition to a more desirable balance for sport fishing.

Mitigation for hunting loss is not considered. Planned water-level manipulations could benefit waterfowl use in the area. After an early August drawdown, Japanese millet could be sown on exposed mudflats, reflooding just prior to or during waterfowl season. This area could serve as a refuge or limited shooting area.

Fishing would be greatly enhanced if an intermittent strip of flooded timber were retained in the lake between about elevations 308 and 312 feet, mean sea level. Such a strip of tree trunks would also help retard shoreline erosion. We do not believe this strip of flooded timber would contribute to a mosquito problem. A sustained streamflow of at least 0.05 c.f.s. per square mile of drainage would help preserve downstream aquatic life.

Care should be taken to prevent the loss of habitat for rare, endangered, and unique species throughout planning, construction, and development of the area. In this regard, the necessary lands for all project features should be acquired at an early date, or easements should be obtained to prevent unnecessary clearing. Selection of a narrow channel design in preference to a wide channel would also reduce damaging effects on flora and fauna of the area. Spoil should not be deposited inside the proposed greenway. Consideration should be given to placing spoil along the cleared, outside edges of the greenway to help shield it from highways and municipal and industrial developments. However, the scenic beauty of the greenway will be enhanced by leaving as many trees as possible, particularly mast-producing trees.

RECOMMENDATIONS

In consideration of fish and wildlife, we recommend that:

1. An intermittent strip of timber be retained in the reservoir between about elevations 308 to 312 feet mean sea level;

2. A minimum reservoir discharge of about 2 c.f.s. be provided;

3. Care be taken to prevent loss of habitat for rare, endangered, and unique flora and fauna of the area;

4. Woodlands of the greenway and reservoir area be preserved;

5. A narrow channel design be selected in preference to a wide channel design; and

6. Spoil be deposited along the outside edges of the greenway to shield the area from views and disturbances of highways and other developments.

7. Water-level fluctuation be planned to benefit waterfowl.

This report has been reviewed and concurred in by the Tennessee Game and Fish Commission. A draft of this report was furnished the Tennessee Department of Conservation for review. In response, we were provided a copy of Chief Naturalist John Page's September 5, 1972, memorandum commenting on the project. Copies of Director Goodrich's and Director Boswell's letters and enclosure are attached.

We appreciate this opportunity to comment on your proposed plans for the Nonconnah Creek Basin project.

Sincerely yours,

Jack E. Hemphill

Acting Regional Director

Attachments

Tennessee Game and Fish Commission

Ellington Agricultural Center • P. O. Box 40747 • Nashville, Tennessee 37220

DAVID M. GOODRICH, DIRECTOR
HAROLD E. WARVEL, ASS'T DIR.

September 7, 1972

Mr. John D. Green
Acting Regional Supervisor
Division of River Basin Studies
U. S. Fish and Wildlife Service
Peachtree-Seventh Building
Atlanta, Georgia 30323

Dear Mr. Green:

We have reviewed and concur with your comments of August 7, 1972 concerning the Nonconnah Creek Watershed.

Very truly yours,

TENNESSEE GAME AND FISH COMMISSION

David M. Goodrich

David M. Goodrich
Director

DMG/jk

cc: Mr. Hudson Nichols
Mr. Reid Tatum

WINFIELD DUNN
GOVERNOR
WILLIAM L. JENKINS
COMMISSIONER
...NN S. FOREMAN
ASSISTANT COMMISSIONER
ANN R. TUCK
ASSISTANT COMMISSIONER

TENNESSEE
DEPARTMENT OF
Conservation
DIVISION OF STATE PARKS
2611 WEST END AVENUE • NASHVILLE, TENNESSEE 37203
W. T. BOSWELL, Director

September 7, 1972

Mr. John D. Green
Acting Regional Supervisor
Division of River Basin Studies
Fish and Wildlife Service
Peachtree-Seventh Building
Atlanta, Georgia 30323

Dear Mr. Green:

Your report of Nonconnah Creek Basin, Tennessee, has been reviewed by myself and staff.

This division concurs in the recreational benefits of this project, and with the exceptions outlined by our Chief Naturalist in his enclosed memorandum, we concur with your preliminary draft.

Thank you for the information and for the opportunity to comment.

Cordially,

W.T. Boswell

W.T. Boswell, Director
Division of State Parks

WTB:dw
Enc.

WINFIELD DUNN
GOVERNOR
WILLIAM L. JENKINS
COMMISSIONER
PENN S. FOREMAN
ASSISTANT COMMISSIONER
ANN R. TUCK
ASSISTANT COMMISSIONER

TENNESSEE
DEPARTMENT OF Conservation
DIVISION OF STATE PARKS
2611 WEST END AVENUE • NASHVILLE, TENNESSEE 37203
W. T. BOSWELL, Director

MEMORANDUM

TO: W. T. Boswell

FROM: John Page

RE: Proposed Nonconnah Creek Basin (Naturalist Views)

DATE: September 5, 1972

Our staff's primary concern is that of a continual degradation man places on HIS environment without realization of the consequences. Conclusive and inconclusive engineering analysis must go beyond commonly recognized major objectives to consider all significant factors involved or disturbed. Especially in this case when a noticeably large engineering project is undertaken, an adequate concept of the relations between obvious purposes and the less obvious socialogical and ecological factors of our environment must be realized.

A steadily increasing part of the American population is coming to realize that the natural environment is one of our most precious possessions, and as such should not be unnecessarily destroyed, mutilated or wasted.

Seemingly, the entire purpose of this 1900 acre reservoir is to provide (1) flood control and (2) recreational benefits. I am not against flood control; this is a vital and necessary function in our technological and engineering competent society. However, the gain realized does not outweigh the possibility of a severe detrimental effect on the ecology of the area. The flooding that has occurred in this area is on a 100 year frequency.

Creeks and rivers are known to overflow their banks during certain times of the year. Man has yet to control nature by damming every tributary in the country.

This area is not in a metropolitan area; Memphis will not become submerged if this creek is not dammed. The proposed site mainly consists of the following:

> 39,882 acres of cropland, 5,865 acres of woodland, 19,941 of pasture and idle land, (total: 65,688). 46,920 acres are urbanized. Only 9,400 acres of the area is inundated by floods of a 100 year frequency.

In reference to recreational facilities provided with the addition of the reservoir, only migratory waterfowl hunting will be benefited. Even this facet has its drawbacks; reduced flooding downstream from the reservoir will diminish the area's attraction to migratory waterfowl. Not one single asset to recreation could develop that is not already available in the surrounding Memphis area.

According to an environmental inventory prepared by Memphis State University, a few species of flora are present that are regarded as rare or endangered. The only records of Dracopis amplexicaulis and Franseria acanthacarpa in the State of Tennessee are from the proposed site for the greenway. The white dog tooth violet (Erythronium albidum) found in the area that will be inundated by the reservoir has been found in only one other locality in Shelby County, Tennessee. Toothcup (Ammania auriculata) occurs below the dam site and is known to be present in only one other locality in western Tennessee. Rare or endangered fauna that may be present include the Southern bald eagle, American peregrine falcon, red-cockaded woodpecker, and Indiana bat. Deep pools in the upper reaches of Nonconnah Creek contain a samll population of largemouth bass, bluegill, other sunfishes, catfishes, minnows, and suckers. Woodlands and agricultural areas support white-tailed deer, squirrels, rabbits, racoon, opossum, bobwhite quail, and mourning dove. When flooding occurs in the fall and winter, inundated areas provide resting and feeding opportunities to migrating waterfowl of the Mississippi Flyway.

With the project, opportunities for sport fishing and wildlife oriented recreation may be improved, although other areas are available, but habitats for some species of wildlife will be impaired. Habitat for certain unique species of vegetation could also be destroyed or significantly altered. About 1900 acres of wildlife habitat will be inundated by the conservation pool of the proposed reservoir. Reduced flooding downstream from the reservoir will also diminish the area's attraction to migratory waterfowl.

The views I have expressed are from a conservationist-naturalist point of view and are not necessarily cognizant of the entire Parks Division. This report was prepared from material received from the District Engineer, Memphis, Tennessee relayed to this office through the U. S. Department of Interior, Fish and Wildlife Service, Atlanta, Georgia. Aerial photographs were also utilized to further understand the entire spectrum of the proposed area in that I have not personally inspected the site.

I have not dwelled on other factors that should be considered when acquiring land and implementing damming procedures. How do local farmers and residents feel about this proposal? Have thorough investigations been initiated to inquire into the feasibility of this Mississippi bottomlands' capability of holding water? These and many other items should be studied extensively before further action is taken.

JP:ss

United States Department of the Interior
BUREAU OF OUTDOOR RECREATION
SOUTHEAST REGIONAL OFFICE
810 New Walton Building
Atlanta, Georgia 30303

IN REPLY REFER TO:
D6427

JUN 1 1973

Colonel John V. Parish, Jr.
District Engineer
U.S. Army Engineer District,
Memphis
668 Clifford Davis Federal Building
Memphis, Tennessee 38103

Dear Colonel Parish:

We have reviewed the interim report, Nonconnah Creek, Tennessee and Mississippi and related preliminary draft environmental statement provided by your letter of April 18, 1973.

Interim Report

We view the recommended plan as the most appropriate of the alternate plans discussed in the report. Cooperation by the Chickasaw Basin Authority and the Tennessee Department of Conservation in operating park areas at the reservoir should assure extensive and diverse recreation opportunity for residents of the Memphis area for both day and overnight use. We find the combined acreage of the State park and local park adequate.

Although the perimeter of the flood pool is buffered by parklands for the greater part of its perimeter, we propose that additional acquisition be considered in the northeast quadrant. A minimum strip 300 feet in width would connect north shore parklands with those on the south. Such additional lands are schematically shown in red on the attached copy of plate 3 from the interim report. While the acreage involved in this additional area is small, its functional importance for public recreation as a buffering strip is evident. Moreover, inclusion of this additional area could allow establishment of a trail or connecting trails around the perimeter of the reservoir. From plate 9 and C-2 in the report, it appears

that existing land use in this area is nonintensive although subject to urbanization and more intensive development. Public acquisition of this additional area could be a desirable and prudent investment.

Preliminary Draft Environmental Statement

1. Project Description

   The description of the proposed project is adequate.

2. Environmental Setting Without the Project

   We have no comments on this portion of the statement.

3. The Environmental Impact of the Proposed Action

   An expansion and quantification of the recreation features and benefits of the project would be desirable in this section. It could include descriptions of park areas, pages 46 and 47 of the interim report, and the relation of the recreation potential to the 3.2 million man-days deficiency in the basin supply; i.e., the project would provide an estimated 1.7 million man-days total for the reservoir and greenway.

4. Any Adverse Environmental Effects Which Cannot Be Avoided Should the Proposal Be Implemented

   We have no additions to suggest for this section.

5. Alternatives to the Proposed Action

   Alternates are adequately presented and described.

6. The Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

   The basic relationship is expressed.

7. Any Irreversible and Irretrievable Commitments of Resources Which Would Be Involved in the Proposed Action Should It Be Implemented

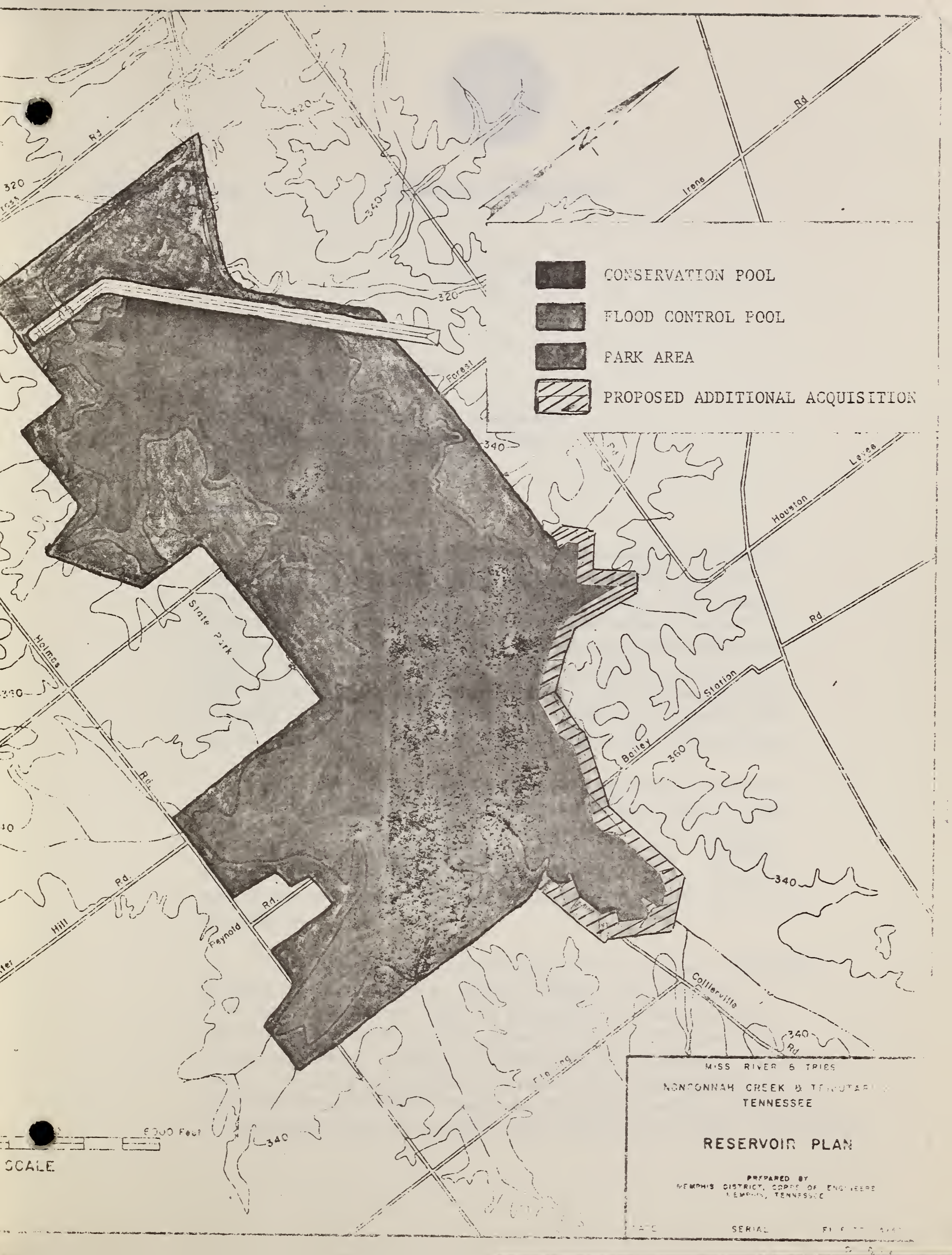
   Commitments of the flood-pool area to the several listed purposes is not clear. From information provided in the interim report, it is concluded that the flood-pool area

would be available for recreation. Two of the uses cited, cropland and pastureland, would not be desirable open space uses in relation to use of proposed park areas.

Sincerely yours,

fo Paul W. Adams
Robert M. Baker
Regional Director

Attachment



CONSERVATION POOL
FLOOD CONTROL POOL
PARK AREA
PROPOSED ADDITIONAL ACQUISITION
Irene
Rd
Forest
Houston
Levee
Rd
Station
Bailey
Colliervillle
Rd
State Park
Holmes
Rd
Rd
Hill
Reynold
Rd
320
340
360
6000 Feet
SCALE
MISS RIVER & TRIBS
NONCONNAH CREEK & TRIBUTARIES
TENNESSEE
RESERVOIR PLAN
PREPARED BY
MEMPHIS DISTRICT, CORPS OF ENGINEERS
MEMPHIS, TENNESSEE
SERIAL

Winfield Dunn
Governor

State of Tennessee

July 6, 1973

Colonel Albert C. Lehman
District Engineer
Memphis District Corps of Engineers
668 Clifford Davis Federal Building
Memphis, Tennessee 38103

Dear Colonel Lehman:

For over a year my staff has been closely following the progress of the study and design of the flood control project for Nonconnah Creek in Shelby County, Tennessee. During the last two months, my staff and several departments of the state government have carefully reviewed the Interim Report of this project. After carefully considering their comments and discussing this project thoroughly with my staff, I have concluded that the project as presently proposed is not in the best interests of the State of Tennessee.

The water resources problems, including flood control, of Shelby County and southwestern Tennessee are very complex, and the concept of this plan was a valid attempt to meet many of these problems simultaneously. However, we have concluded that the proposed project does not adequately fit the topography and economy of the area and should be modified.

The Interim Report discloses that the primary advantage claimed for Alternative 6, which includes the proposed Nonconnah Reservoir, over the advantages of Alternative 5, which depends upon channel enlargement to solve the flood control problems, is that of recreational development. However, many local citizens and the Tennessee State Departments of Conservation and Public Health have stated that this site is not an appropriate site for a state park because of the flat, monotonous

topography, almost total lack of vegetation, potential severe problems of mosquito control, water quality, and access.

Local support for the proposed state park has declined significantly within the past two years. The original sponsors of the bill to establish the state park have now introduced another bill to repeal the original act and deauthorize the park. For this reason and the objections to the proposed Nonconnah Park enumerated above, I have decided that the interests of the State of Tennessee and of Shelby County would best be served if the money originally intended for the Nonconnah State Park were to be used instead to improve and upgrade Meeman-Shelby Forest State Park. I intend to include this request in the proposed budget to be submitted to the next session of the Tennessee General Assembly.

If the Corps of Engineers and the Soil Conservation Service still wish to proceed with the project in the absence of a state park on the south shore, the design will have to be modified to meet state standards. The Department of Public Health advises me that the proposed method of constructing and operating the reservoir will not meet their minimum standards for mosquito control and the Corps of Engineers would not be able to receive a permit for construction of the impoundment as presently designed. They will require that no areas be covered by water less than three feet deep during the mosquito breeding season, and they consider the area covered by the spring surcharge as part of the normal lake subject to this requirement.

If the project as currently proposed by the Corps of Engineers and the Soil Conservation Service cannot be modified to overcome these deficiencies, or cannot be justified in the absence of a state park, I request that further study be given to solving the flooding problems along Nonconnah Creek by enlargement and improvement of the existing channel within a greenway, similar to that proposed as Alternative 5 in the Interim Report.

If you have any questions concerning my position on

this matter, I would be happy to meet with you personally or to send a member of my staff to talk with you at length.

Sincerely,

Winfield Dunn

Winfield Dunn

lms

DISPOSITION FORM

For use of this form, see AR 340-15; the proponent agency is The Adjutant General's Office.

REFERENCE OR OFFICE SYMBOL	SUBJECT
LMMED-PF	Conference with State Agencies Concerning Nonconnah State Park

TO MEMO FOR RECORD FROM Plan Formulation Section DATE 23 July 1973 CMT 1

Caldwell/jwh/3347

1. This is a record of a meeting held in the Andrew Jackson Office Building in Nashville on 20 July 1973. Present at the meeting were: Mr. Ed Thackston; Mr. Jim Paine, Department of Urban and Federal Affairs; Mr. Walter Criley and two assistants, Tennessee Conservation Department; Mr. Jim Alt, Tennessee Department of Public Health; Mr. Jim Mitchell and Mr. Dwight Treadway, Soil Conservation Service; and Mr. M. B. Flanary, Mr. N. D. Caldwell, and Mr. Steve Wilson, Corps of Engineers.

2. The purpose of this meeting was to discuss the comments of the state concerning the proposed lake on Nonconnah Creek, and particularly the proposed state park as set forth in letter from Governor Dunn to Colonel Lehman dated 6 July 1973.

3. Representatives of the state stated that the state park plan had been prepared at the direction of the State Legislature because of a recognized need for recreation development in southwest Tennessee, and this site appeared to be the only option open to the state. However, state planning officials have always recognized that the Nonconnah Park site does not provide the natural setting normally desired for a state park. Within the past several months, certain members of the Legislature who sponsored the bill to authorize the state park have reconsidered and are now in opposition to the park development. It is expected that a bill to deauthorize the park will be considered in the next legislative session. In addition, certain lands adjacent to the existing Shelby Forest State Park have been put on the market for sale, and if purchased by the state, would provide a more favorable option to the state for state park development.

4. State officials are also concerned with probable cost of lands for the state park at the Nonconnah site. It is apparent from opposition expressed by landowners that condemnation will be required for land purchase. The state believes that because of this and the rate of current land price increases that lands could cost as much as two to three times the current estimate by the time they are actually purchased.

5. The following paragraphs outline discussions on specific points of concern mentioned in Governor Dunn's letter of 6 July 1973.

a. Topography and Vegetation. The proposed park site is not in the type of setting normally considered for a state park. The park as proposed would be a high density use facility, generally in an open area and urban atmosphere, and would be more appropriately described as a large urban park than a park with the rural character which typifies a state park. State officials recognize the need for such park developments as would serve the urban population of Memphis and agree that a park at this site would provide needed recreation opportunity

and would likely be intensively used. However, the state administration does not feel that state park funds in amount necessary to install this facility should be used to construct parks which are primarily urban-oriented. They believe that parks to serve localized urban areas, as they think this park would, should be financed by local governments using only those state funds appropriated for grants to urban areas for local park development.

b. Mosquito Control. The primary concern of the state on this point was mosquito breeding potential of the area of less than 2 feet depth created by spring surcharge to maintain minimum lake depths. Mr. Alt of the Health Service agreed that without the surcharge there would not likely be any net increase in mosquito production at the reservoir site if it is constructed and operated to conform to state standards. He further agreed that there would be a decrease in mosquito breeding in the downstream channel if a minimum flow of 3 cfs is made from the reservoir as proposed.

It was also agreed that the minimum depth of normal pool as specified in the Health Commissioner regulation is 2 feet as opposed to 3 feet. The lake as proposed would provide the 2 feet minimum depth plus 1 foot of freeboard. A detailed analysis of rainfall records and water losses from the proposed lake made by the Corps of Engineers indicates that minimum depths of 2 feet can be maintained without imposing the objectionable surcharge condition.

c. Water Quality. The primary concern of the state with regard to water quality is related to proposed body contact sports, such as swimming, in the lake. The Health Department does not encourage swimming in any open water but does not usually enforce standards for swimming areas except those actually operated by the state or by an organized group.

Water quality standards for swimming require less than 200 fecal coli/100 ml and visibility of a specified object at a depth of 5 feet. Water sample tests from tributaries entering the lake site contain a much higher level of fecal coli than permitted by the standard for body contact sports. It is believed that a large part of that contamination comes from inadequately designed septic systems and leakages from Collierville sewers, and that water in the lake will never meet the standard for swimming. State officials agree that there are no water quality parameters which would restrict use of the lake for activities other than body contact sports. They agree that the lake would provide good fishing opportunity. There is some concern over possible turbidity and appearance of the lake from silt, but this does not constitute concern from a standpoint of public health.

d. Access. State officials agreed that the network of roads through the area of the lake would likely provide adequate access to the lake and recreation areas. The concern over access was evidently based on the supposition that all traffic would reach the area by Poplar Avenue without recognizing several other roadways coming into the area from various population centers.

6. From this discussion, it is apparent that the state administration does not desire to pursue development of the state park through the Corps of Engineers, primarily for reasons outlined in paragraphs 4 and 5a above.

7. It is expected that Colonel Lehman will meet with Governor Dunn within the next few days to further discuss these matters.

N D Caldwell

N. D. CALDWELL
Civil Engineer
Plan Formulation Section

DISPOSITION FORM

For use of this form, see AR 340-15; the proponent agency is The Adjutant General's Office.

REFERENCE OR OFFICE SYMBOL	SUBJECT
LMMED-PF	Meeting with Governor Dunn Concerning Nonconnah General Investigation Studies

TO Memo For Record FROM Executive Office DATE 2 August 1973 CMT 1

1. This memorandum is prepared as a record of a meeting with Governor Winfield Dunn of Tennessee on 30 July 1973. Persons attending the meeting were as follows:

Corps of Engineers:
COL A. C. Lehman
Mr. Gene Dodson
Mr. N. D. Caldwell

Soil Conservation Service:
Mr. Paul Howard
Mr. Jim Mitchell

State of Tennessee:
Governor Winfield Dunn
Mr. Jim Paine
Mr. Ed Thackston
Mr. Walter Criley
Mr. Jim Alt

Chickasaw Basin Authority:
Mr. Robert James
Mr. Thomas Todd
Mr. William Farris
Mr. Marvin White

News reporters for the Commercial Appeal and WREC-TV.

2. The purpose of this meeting was to discuss the position of the state administration as set forth in Governor Dunn's letter dated 6 July 1973.

3. Governor Dunn stated that his position as set forth in the letter of 6 July stands. However, he stated further that his position has apparently been misunderstood or misrepresented, particularly concerning flood control features of the proposed plan. Primarily because of increasing land costs, local opposition to the state park, and the fact that the state planning staff does not consider the Nonconnah site to be the best location for state park expansion in Shelby County, Governor Dunn stated that he will not pursue nor participate directly in establishing a state park on Nonconnah Lake. The state's concern with the flood control features of the Nonconnah were related to questions concerning whether the proposed lake can be justified without the state park, and can be constructed to meet state standards for mosquito control or other requirements.

4. From a conference with state agency representatives on 20 July 1973 (reference memo dated 23 July 1973), we have determined that the proposed Nonconnah Lake can be modified to meet state standards for flood control operation. The Governor was informed that because of greater dependability, reduced cost and inconvenience of annual maintainance, and considerations of environmental quality, the Memphis District is prepared to recommend construction of the reservoir in favor of the more extensive channel enlargement alternative. The reservoir plan, without the state park, will offer opportunity for needed recreation, fish and wildlife development. The final plan to be recommended will include such recreation development as the Chickasaw Basin Authority, the city of Memphis, or Shelby County may wish to sponsor.

5. Governor Dunn stated that in his own mind he is not assured that the most favorable means of flood control in the Nonconnah Basin is the proposed impoundment. However, recognizing the urgent need for flood control, he is willing to leave the question of the most efficient means of flood control to the expertise of the Corps of Engineers and the Soil Conservation Service. He stated that these agencies should look to the Chickasaw Basin Authority for a final decision on the desirability of the proposed lake, since that agency is the legally constituted arm of state and local governments which will serve as local sponsor for any flood control or recreation development.

6. Governor Dunn indicated that although he does not wish to participate in the proposed state park he has taken no official stand on the lake for flood control or recreation development by local agencies and will not oppose the lake if adopted as the recommended plan of the Chickasaw Basin Authority.

A C Lehman
A. C. LEHMAN
Colonel, Corps of Engineers
District Engineer

C H I C K A S A W   B A S I N   A U T H O R I T Y

ROOM 741 • 160 NORTH MAIN STREET
SHELBY COUNTY ADMINISTRATION BUILDING
MEMPHIS, TENNESSEE 38103

September 14, 1973

Colonel A. C. Lehman, District Engineer
Corps of Engineers
Federal Building
Memphis, Tennessee

Mr. Paul Howard
Tennessee Conservationist
Federal Building
Nashville, Tennessee

Gentlemen:

The alternative plans for erosion control, flood control, recreation, and other improvements in the Nonconnah Basin as jointly developed by the Corps of Engineers and the Soil Conservation Service have been reviewed by the Chickasaw Basin Authority. The plan as recommended by the Corps and Soil Conservation Service, to include flood control storage on the Main Channel of Nonconnah Creek and the Johns Creek Tributary is considered to be the most desirable plan for flood control and has been adopted by the Chickasaw Basin Authority.

It is our intention to fully develop and utilize the recreation opportunity of the proposed Nonconnah Lake.

The Chickasaw Basin Authority is fully empowered under state law to serve as local sponsors and meet local cost requirements for Federal water resource development projects in the Nonconnah Basin. The Basin Authority will provide local contribution and other assurances as normally required for construction and operation of the recommended flood control works, and recreation developments to include the recommended recreation storage, the North Park and South Park on the Nonconnah Lake and the greenway development, depending on availability of funds and authorization of the project at the Federal level.

Colonel A. C. Lehman
Mr. Paul Howard

As you are aware, local and state governments have made more than $11,000,000.00 available to the Authority for advance purchase of lands which will be needed for this project. Lands are currently being purchased for the proposed Nonconnah Reservoir and North Park. It is anticipated that the cost of lands for the flood control reservoir on the Main Channel of Nonconnah Creek will be assumed by the Corps of Engineers in accordance with established Federal policy. If the funds which have been invested in reservoir lands are returned to the Authority after the project is authorized and funded by the Congress, the funds will be available to meet local cost requirements in other projects features.

It is requested that authorization of the project be gained as soon as possible to avoid unnecessary delays in proceeding with these vitally needed flood protection measures.

Very truly yours,

Robert B. James, Chairman
Chickasaw Basin Authority

DISPOSITION FORM

For use of this form, see AR 340-15; the proponent agency is The Adjutant General's Office.

REFERENCE OR OFFICE SYMBOL	SUBJECT
LMMED-PF	Coordination with MATCOG - Nonconnah General Investigation Studies

TO	FROM	DATE	CMT 1
MEMORANDUM FOR RECORD	Plan Formulation Section	9 October 1973 Caldwell/jwh/3347	

In a meeting with General William M. Fondren (Ret.), director of MATCOG, and Mr. Tom Welman, project coordinator, on 8 October 1973, they stated that MATCOG had no comment on the Nonconnah Creek project recommendations other than those furnished to the Chickasaw Basin Authority by letter dated 24 August 1973.

N D Caldwell

N. D. CALDWELL
Civil Engineer
Plan Formulation Section

MATCOG

Mississippi-Arkansas-Tennessee
Council of Governments
ROOM 501 ▪ 125 NORTH MAIN STREET ▪ MEMPHIS, TENNESSEE 38103

TELEPHONE (901) 534-9775

August 24, 1972

Mr. Robert James, Chairman
Chickasaw Basin Authority
160 North Main - Room 741
Memphis, Tennessee 38103

Re: PNRS/Metropolitan Clearinghouse
Application for Funds
Nonconnah Creek Watershed Project

Dear Bob:

At its meeting on August 23, 1972, the MATCOG Executive Committee considered the above referenced project. Prior to this review and because of its regional implications, the project was referred to various agencies for their comments.

The Executive Committee, after considering the project and all comments received, strongly endorsed it. The Committee believes that it's a project of tremendous importance to the entire community and urges that its implementation be prusued vigorously.

The comments of the Shelby County Engineer and those of the Environmental Action Council of Memphis are attached. These are forwarded for your consideration in any future technical evaluation of the project.

Best wishes.

Sincerely,

Bill

William M. Fondren
Executive Director

WMF/gr
Enclosures (2)

SHELBY COUNTY COMMISSIONERS
160 NORTH MAIN STREET
MEMPHIS, TENNESSEE 38103

LEE HYDEN
COMMISSIONER OF
ROADS, BRIDGES AND PENAL FARM

GEORGE DAND
COUNTY ENGINEER
ROOM 771

2

R   D
AUG -2 1972
M   G
FICE

August 1, 1972

Mr. William N. Fondren
Executive Director
Mississippi-Arkansas-Tennessee
Council of Governments
Room 501, 125 North Main
Memphis, Tennessee 38103

Re: PNRS/Metropolitan Clearinghouse
Application for Funds
Nonconnah Creek Watershed Project

Dear Mr. Fondren:

I appreciate the opportunity to comment on referenced project.

It is my opinion that the project is one of the most important and far-reaching under consideration in our community. I believe that the pluses to the community far outweigh any of the negatives and that implementation should be pursued vigorously.

Thorough consideration appears to have been given to all the affects of Reservoir No. 3. However, it appears that the other structures (11, 13, 15 and 17) will also require alteration in existing facilities and it appears to the writer that the affects of these alterations should be evaluated and considered.

If I can be of any other assistance, please advise.

Yours very truly,

George A. Dando
County Engineer

GAD:bj

cc: Commissioner Lee Hyden
Mr. Robert James
Mr. C. R. Patton

AUG 28 1972
SHELBY CO.
REAL ESTATE
OFFICE

THE UNIVERSITY OF TENNESSEE MEDICAL UNITS
COLLEGE OF PHARMACY
DEPARTMENT OF MOLECULAR AND QUANTUM BIOLOGY
MEMPHIS, TENNESSEE 38103

August 21, 1972

RECEIVED
AUG 22 1972
MAYOR'S OFFICE

Mr. William M. Fondren
Mississippi-Arkansas-Tennessee
Council of Governments
125 North Main Street
Room 501
Memphis, Tennessee 38103

Dear Mr. Fondren:

Your letter dated August 2, 1972, and the attached copy of the Environmental Statement for the Nonconnah Creek Watershed Project to Doctor Howard Vogel has been referred to me for my comments.

In general the Environmental Action Council of Memphis supports the philosophy of developing green ways along our urban streams. I personally feel that the development of a green way along Nonconnah should incude some flood control measures.

My major criticism of the project as presently outlined is that not enough acreage is being planned for public use as park land, hiking, and bicycle trails as well as wilderness areas. The project states that 1,050 acres of bottom land hardwood trees will be cut while only 734 acres are to be planted. As the flood control project will provide a considerable financial benefit to industries and individuals in the present 100 year flood plain as well as land speculators in the upper basin area, it seems that the public's benefit should be greater than the limited green way and recreational area presently planned. I feel that the major recreational lake (#3) should be surrounded completely by publicly owned land. I would also like to see smaller parks developed at the other Floodwater retarding structures. As the value of the land in these areas will increase in place, it would seem that now would be the time to plan increased recreational facilities.

Sincerely,

Larry J Powers

Larry J. Powers, Ph.D.
President, Environmental
Action Council of Memphis

LJP:slh

cc: Dr. Howard Vogel

Memphis and Shelby County Planning Commission

CITY HALL ▪ 125 NORTH MAIN STREET ▪ MEMPHIS, TENNESSEE 38103 ▪ TELEPHONE 534-9626

May 30, 1973

John V. Parish, Jr.
Colonel, Corps of Engineers
District Engineer
Memphis District, U. S. Army Corps of Engineers
668 Clifford Davis Federal Building
Memphis, Tennessee 38103

Re: Nonconnah Creek Basin Project

Dear Colonel Parish:

In response to your letter of April 18, 1973, the draft report and preliminary draft environmental impact statement on the Nonconnah Basin project have been reviewed by the staff of the Memphis and Shelby County Planning Commission.

The proposed Nonconnah Reservoir and related improvements are consistent with the Planning Commission's Parks, Recreation and Conservation Plan, and I am pleased to offer my support for these flood control and recreation facilities.

I look forward to assisting in the continued planning and development of these projects.

Sincerely,

Robert H. Miller
Director of Planning

RHM/jr

City of Memphis

Tennessee

WYETH CHANDLER
MAYOR

October 17, 1973

Colonel A. C. Lehman, District Engineer
Memphis District, Corps of Engineers
668 Clifford Davis Federal Building
Memphis, Tennessee 38103

Dear Colonel Lehman:

Reference is made to the proposed flood control project along the Nonconnah Creek basin described as the recommended Plan 6 of the draft Interim Report of Nonconnah Creek, Tennessee-Mississippi, prepared by your office jointly with the Nashville office, Department of Agriculture and Soil Conservation.

After review with the City Engineer's office, I would like to convey to you my full support and recommendations for the proposed implementation of this major flood control, flood management project with probably recreational amenities.

The City of Memphis is cognizant of the tremendous need for such a project in view of the rapid urbanization which is currently taking place along this major drainage basin in the city.

The City of Memphis views this as an extremely welcomed opportunity for resolving a problem, the solution of which requires exorbitant funds which the City of Memphis has been unable to provide. The project would enable the City to join with its equitable share in the financing of such a project. You can be assured that the City will back this project to its full implementation.

If I can be of further assistance in the future process of securing Congressional approval, please advise.

Sincerely,

Wyeth Chandler

WC:mh

SHELBY COUNTY QUARTERLY COURT
C. W. BAKER, CHAIRMAN
ROOM 619 • 160 NORTH MAIN STREET
SHELBY COUNTY ADMINISTRATION BUILDING
MEMPHIS, TENNESSEE 38103

October 23, 1973

Colonel A. C. Lehman, District Engineer
Memphis District Corp of Engineers
668 Clifford Davis Federal Building
Memphis, Tennessee 38103

Dear Colonel Lehman:

The Quarterly County Court of Shelby County, Tennessee has long been a supporter of the proposed flood control project along the Nonconnah Creek Basin and enclosed you will please find a certified copy of the Quarterly County Court's resolution duly adopted on October 2, 1972, which sets forth the County of Shelby's support of this project.

The recommended Plan No. 6 of the draft interim report of the Nonconnah Creek Basin as prepared by your office, jointly with the Nashville Office of the Department of Agriculture Soil Conservation Service, has been reviewed with the County Engineer and provides the most feasible approach to flood control in the Nonconnah Basin. The completion of this most important project would, in addition to protecting areas already developed along the Nonconnah Basin, make available additional lands for both public and private development.

Sincerely yours,

C W Baker

C. W. Baker, Chairman
Shelby County Quarterly Court

CWB/jke

Enclosure

Shelby County Quarterly Court

OCTOBER Term, 19 72

Memphis, Tenn. OCTOBER 2, 1972

Court met, pursuant to adjournment, Honorable C. W. Baker Chairman, present and presiding, when the following proceedings, among others, were had, to-wit:

ITEM 12
NONCONNAH BASIN PROJECT - PETITIONING CONGRESS FOR INITIAL FUNDING APPROPRIATION

Mr. Drennon, County Attorney, announced Item 12, Discussion/Resolution - Petitioning the U. S. Congress to authorize and make an initial appropriation for funding the Nonconnah Basin Project.

The following resolution was presented to the Court:

(SEE FOLLOWING PAGES FOR RESOLUTION)

#12

Item 12
10-2-72

Squire Perkins

RESOLUTION

WHEREAS, The U. S. Corps of Engineers and the U. S. Soil Conservation Service have proposed to complete a joint report as requested by the U. S. Senate Public Works Committee on or about January 1, 1973; said project to provide flood control, surface water management, erosion and sediment control, water oriented recreation, water pollution control, Greenway development and other environmental enhancement of the Nonconnah Creek basin lying in Shelby County, Tennessee, DeSoto County Mississippi and Marshall County Mississippi, and vitally effecting the urban area of Memphis, Tennessee, and

WHEREAS, The plans for this project have been intensively and extensively researched, and

WHEREAS, The Quarterly Court of Shelby County, Tennessee and the City Council of Memphis, Tennessee have already expended approximately one and one quarter million dollars on land purchase to prevent preemption of part of the site for a reservoir and have secured parcel surveys for the site of the major reservoir and have authorized the appropriation (by bond issues, if necessary) of two and one half million dollars each, a total of five million dollars for advance land acquisition, and

WHEREAS, The General Assembly of the State of Tennessee has authorized the issuance of five million dollars in bonds to match the five million dollars provided by the County of Shelby and the City of Memphis, and

WHEREAS, The request for this project has gone forward to the Public Works Committee of the U. S. Senate for authorization under Public Law 87-639 of 1962, and

WHEREAS, The urbanizing process of the City of Memphis presents serious threats of preemption of necessary sites for flood control as well as enhancing values of land, and

WHEREAS, If authorization and initial funding is not provided this year 1972, it will be deferred for two years until 1974.

NOW, THEREFORE, BE IT RESOLVED AND ORDERED BY THE QUARTERLY COUNTY COURT OF SHELBY COUNTY, TENNESSEE, That the Governor and Speakers of the House and Senate of the General Assembly of Tennessee and the City Council of the City of Memphis, Tennessee be urged to petition the Senate and House of Representatives of the United States to authorize and make an initial appropriation for the Nonconnah Creek basin project in Tennessee and Mississippi contingent on a feasible project being submitted to the Senate Public Works Committee.

ADOPTED October 2, 1972

Whereupon, passage of the resolution was moved by Justice Perkins, duly seconded by Justice Butler.

Chairman Pro Tempore Farris asked the Clerk to call the roll. The roll was called, with the following results: Bailey, Cooper, Turner, Perkins, Butler, Maxwell, Taliaferro, Schilling, Canale and Farris voting aye. Ayes, ten; Noes, none; Absent, one (Baker).

Chairman Pro Tempore Farris declared the MOTION CARRIED.

State of Tennessee, } ss.
SHELBY COUNTY

I, ROBERT M. GRAY, Clerk of the County Court of this County, do hereby certify that the foregoing Four (4) pages contain a full, true and exact copy of the Resolution - Petitioning the U. S. Congress to authorize and make an initial appropriation for funding the Nonconnah Basin Project.

as the same appears of record or on file in Minute Book No. 66, Pages 169 and 170 of this office.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seal of said Court, at office, in the City of Memphis, this 22 day of October 1973.

ROBERT M. GRAY,
County Court Clerk
By Patricia Russell D. C.

CLARKE-MEMPHIS

ATTACHMENT I

INFORMATION CALLED FOR BY
SENATE RESOLUTION 148, 85th CONGRESS

INTERIM REPORT
NONCONNAH CREEK BASIN
TENNESSEE AND MISSISSIPPI

ATTACHMENT 1

1. PROJECT DESCRIPTION AND ECONOMIC LIFE

This report recommends authorization and construction of a project to be jointly developed by the Corps of Engineers and Department of Agriculture. The project will provide for:

a. A basin wide program of land treatment for erosion and sediment control on 35,010 acres; three floodwater control structures on the Johns Creek tributary; a multipurpose flood control and recreation lake; 7 miles of channel cleanout; 12 miles of channel enlargement; development of recreation, preservation, and enhancement of natural environmental values within a 600 foot wide greenway-floodway extending 20 miles along Nonconnah Creek. Additional information on the recommended project is contained in Section XII of this report.

b. The evaluation period used in the economic analysis in the report is 100 years.

2. PROJECT COSTS

Estimated project costs are as follows:

	First Cost		Annual Costs Operation, Maintenance And Replacement	
	Federal	Non-Federal	Federal	Non-Federal
	$	$	$	$
Land Treatment	1,370,500	1,019,500	-	-
Structural Work	48,501,000	15,437,000	150,000	645,000

3. BENEFIT-COST RATIO

Benefits used in evaluating the structural improvements were prevention of flood damages, and recreation benefits based on user-day values. Economic evaluation as presented in the report is based on an interest rate of 5-5/8%. The project has also been evaluated for periods of 50 and 100 years using an interest rate of 6-7/8% as set forth in Principles and Standards for Planning by the Water Resources Council. Annual charges, benefits, and benefit-cost ratios for structural improvements are as follows:

	5-5/8% Interest			6-7/8% Interest		
	Ann. Cost	Benefit	BCR	Ann. Cost	Benefit	BCR
	$	$		$	$	
50 year Evaluation	4,640,800	6,583,400	1.4	5,335,000	6,489,500	1.2
100 year Evaluation	4,406,700	6,637,600	1.5	5,068,700	6,523,300	1.3

4. INTANGIBLE BENEFITS

In addition to benefits which have been evaluated, the recommended plan would provide additional benefits for which no satisfactory method of evaluation has been established. The project would reduce inconvenience associates with loss of public facilities and services during and following flooding in the urban areas. The possibility of loss of life due to flooding would be reduced. Environmental values would be enhanced by preservation and restoration of natural values and provision of open space within an area being converted from a natural to an urban character.

5. EXTENT OF INTEREST IN PROJECT

Local governments and citizens living in areas subject to flooding are anxious to have the recommended project authorized and constructed to eliminate possible catastrophic flood losses. Others are interested in early development of recreational and environmental features of the recommended plan, which may be pre-empted by continued urban development within a few years.

Local agencies have already appropriated more than $11,000,000 to meet a part of local cost requirements.

Landowners and citizens within the area of recommended storage structures oppose those project features because of land acquisition for public use and possible effects on the surrounding communities.

6. LOCAL COOPERATION

Local cooperation requirements for the recommended land treatment will be generally as outlined in the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress; 68 Stat. 666), as amended. Local requirements for the flood control features are generally in accordance with the 1936 Flood Control Act as amended. Project features with a recreation purpose will require local contribution in accordance with established policy.

7. EFFECTS OF PROJECT ON STATE AND LOCAL GOVERNMENTS

The recommended project will reduce costs incurred by the state and local governments by flood damage to public utilities, and by reducing costs of flood relief to affected citizens. Certain costs for project construction, operation, and maintenance will be a responsibility of local governments as outlined in Section XII of this report.

Real estate requirements for project construction will result in conversion of land from private to public ownership, thereby reducing the tax base. However, increased investment in other developments as a result of flood control and recreation features should more than replace taxable property value affected by the project.

The project as recommended is in accordance with short and long range community development and land use plans of local planning agencies.